

# COAL AGE

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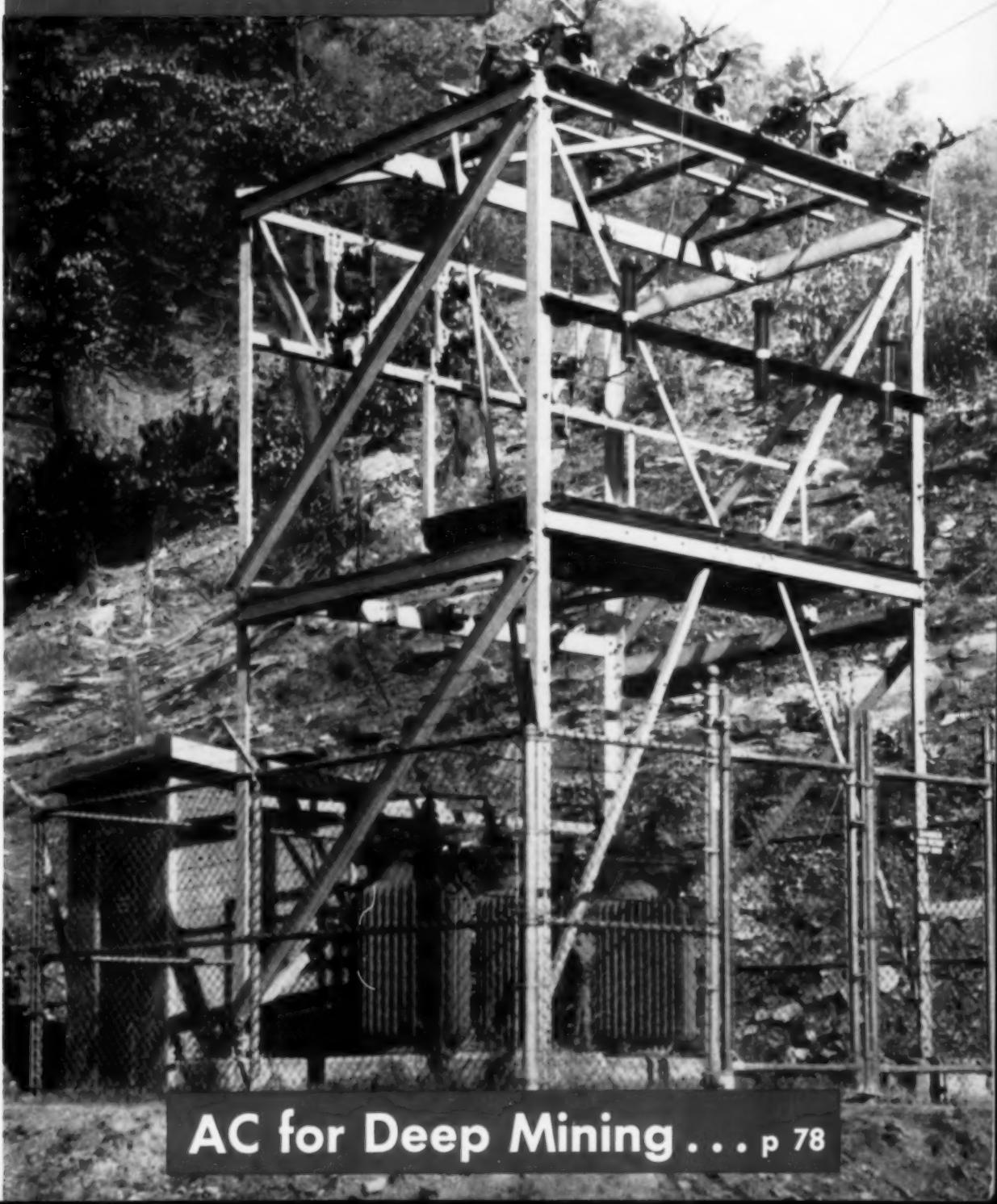
MAY 1958

Improved Preparation...p 100

New Bit Designs.....p 108

Percussion Drilling.....p 114

A McGRAW-HILL PUBLICATION



AC for Deep Mining ... p 78

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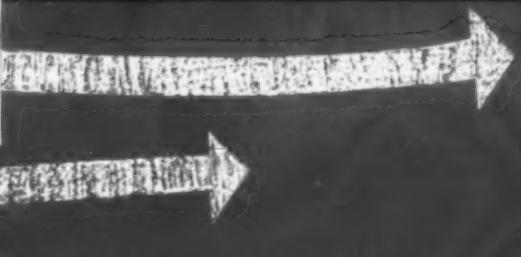
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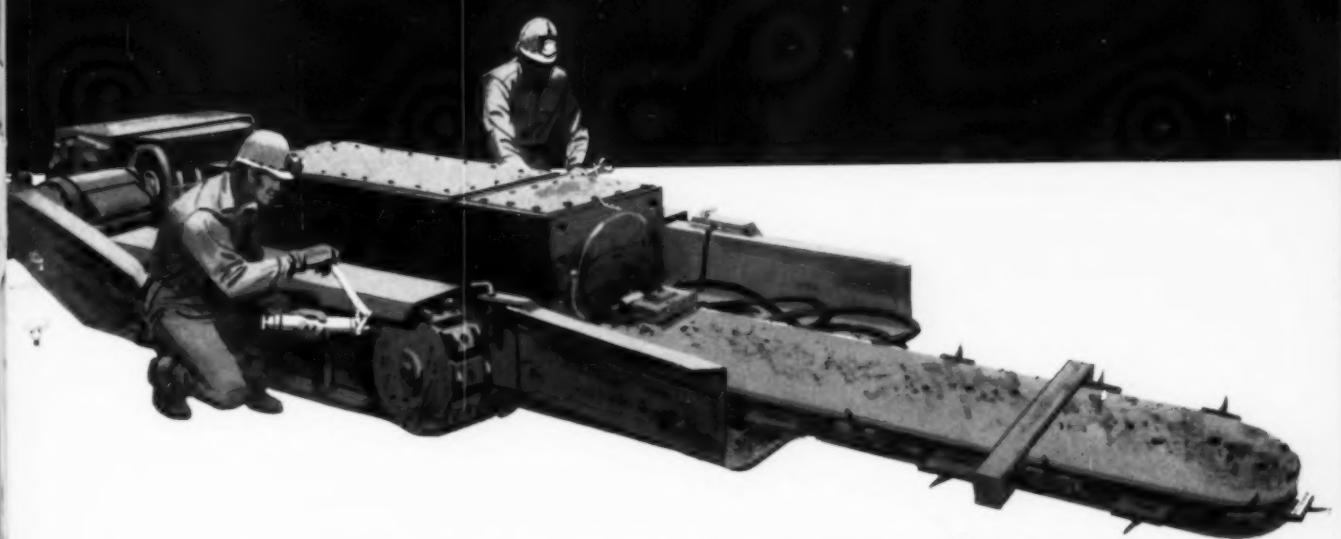
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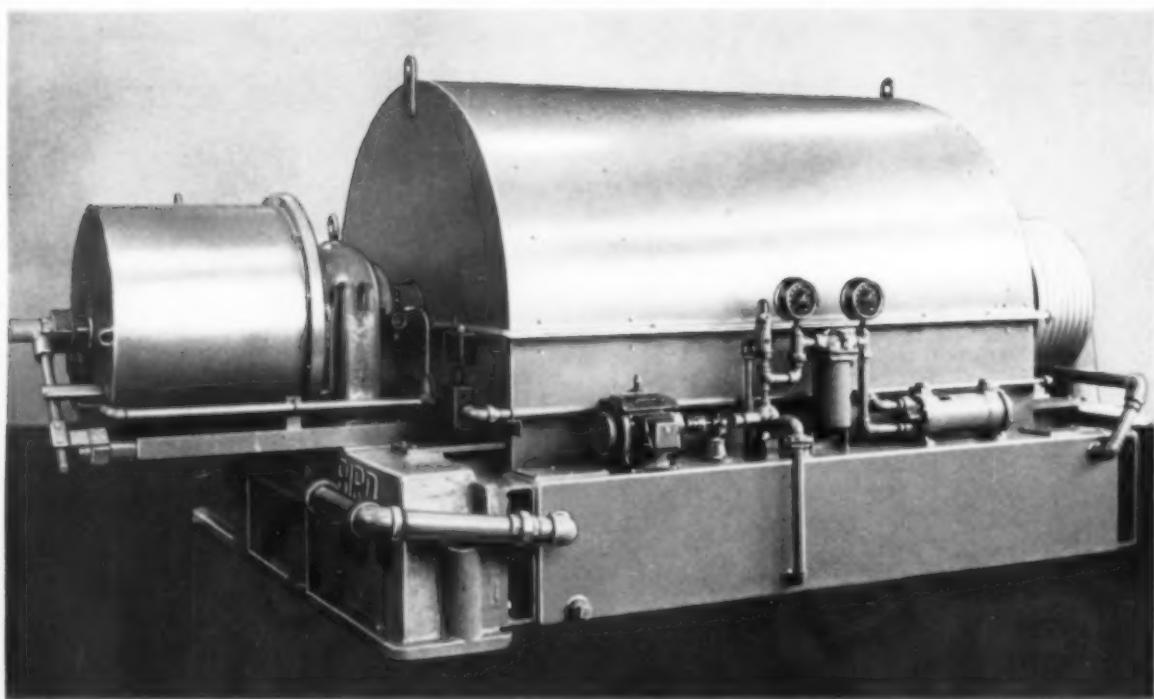
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## This Month in MAY 1958

# COAL AGE

### Features This Month:

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### Departments This Month:

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### ► Electric Power

AC for Deep Mining ..... p 78

Daniel Jackson Jr., Assistant Editor, *Coal Age*

Written for the manager and operating official, this report explains in logical sequence the functions and characteristics of the various components in an alternating-current power system. Leading off is a review in laymen's language of the theory of AC electricity. Text of the report is developed to follow a one-line diagram of a power-distribution system for deep mining.

**Extra**—Key to circuit diagramming, using approved symbols of the American Standards Association.

### ► Anthracite Deep Mining

All-Conveyor Anthracite Mining ..... p 92

High productivity is attained at Hanover Coal Co., Hanover Twp., Pa., by planning mine layout for most economical drainage and ventilation. Maximum recovery of a tract of solid coal is achieved by driving rooms, then splitting pillars and robbing back to gangways. Transportation from face to surface is provided by chain and shaking conveyors in rooms and gangways and by belt conveyors in two gangways and in main slope.

**On the Side**—How Hanover gets more service from coal-drilling bits.



### ► Coal Preparation

Improved Preparation Solidifies Market Position ..... p 100

Installation of new equipment for heavy-media cleaning, heat drying and precipitation blending makes it possible for Knight Ideal Coal Co., Wellington, Utah, to improve position in existing market and to bid for new accounts in the U. S. and overseas. New facilities handle 150 tph, raw feed, to produce a finished product averaging 3% lower in ash. Process water is taken from a well, and closed water circuit contributes to conservation of water and solids.

**Stopper**—Full description of a new-type thermal dryer.

### ► Bit Design

New Bit Designs Contribute to Lower-Cost Coal Cutting ..... p 108

**J. C. Leighton**, Carbide Products Design Engineer  
Metallurgical Products Dept., General Electric Co.,  
Detroit, Mich.

Laboratory tests on a tool dynamometer and actual field tests of cutting bits show that improved bit performance may be achieved through design changes. On the basis of these tests it is recommended that a negative

(Continued on p 7)

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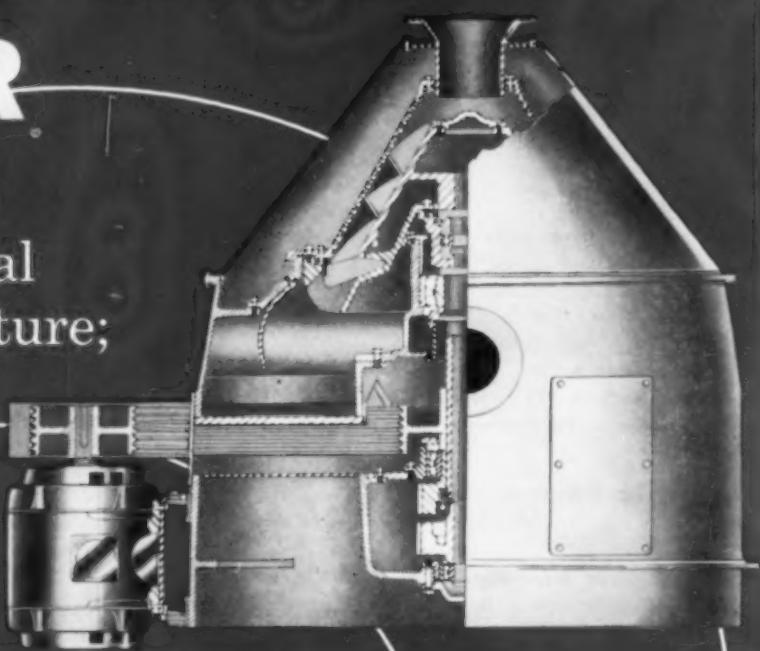
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### This Month in Coal Age—Cont'd

10-deg rake angle and a 10-deg relief angle will provide longer useful bit life and lower cutting costs.

**Highlight**—Line cuts show bit nomenclature.



### ► Stripping

*Percussion Unit Drills Hard Rock* . . . . . p 114

Hard rock overlying a dipping anthracite vein is drilled by air-powered machine which employs a "down-the-hole" hammer to make 6½-in blastholes. Ammonium nitrate and fuel oil are used as blasting agent. Drill stem is equipped with special water check to keep water and dirt out of hammer. New electric dragline, one of the largest on crawlers removes broken rock at Park Place, Pa., operations of Sullivan Trail Coal Co.

### ► Transportation

*Dry Pipelining of Coal* . . . . . p 118

**Theodore Nagel**, Mechanical-Engineering Consultant, New York, N. Y.

New micronizing techniques, by which coal can be shattered to minus 5 microns in particle size, may lead to long-distance pipeline shipment of coal, using air as the carrying medium. Assuming a 10-in pipeline 100 mi long, coal could be shipped for an estimated 50¢ per ton from mine to burners. Additional research into final design still is required. However, the required state of fineness can now be achieved.

**Sidelight**—Amortization figures for a dry pipeline.

### ► Gasification Research

*The Outlook for High Btu Gas from Coal* p 120

**Dr. Martin A. Elliott**, Director, Institute of Gas Technology

The day is virtually inevitable sometime during the 1970s when coal-based synthetic natural gas will become a commercial reality. This is indicated by the adverse

(Continued on p 11)

## This Month in **COAL**

**NO RELIEF**—The April bituminous production rate failed to move up from its depression level of slightly over 7 million tons per week. Going into May there was little indication of any basic change in the picture.

Though there were some encouraging signs they were more than offset by the low level of activity in steel and other key industries in April. When steel will get back up to a rate of 75% of capacity—probably the minimum from which to reach a firm conclusion that the depression is on its way to being over—still is the big question. The answer? Probably not before fall. This augurs a slow summer for bituminous. The one bright spot remains, however, consumption by electric utilities.

**ANTHRACITE TOO**—Anthracite also continued to feel the effects of the depression in addition to its "regular" rate of loss. The latter is calculated by the Anthracite Institute at 1 million a year, while the additional depression loss was running ½ million. Cold weather still could help materially in the 1958-59 heating season. Otherwise, the decline will be of the magnitude previously noted—and perhaps more if next winter should turn out to be another in the series of really warm ones.

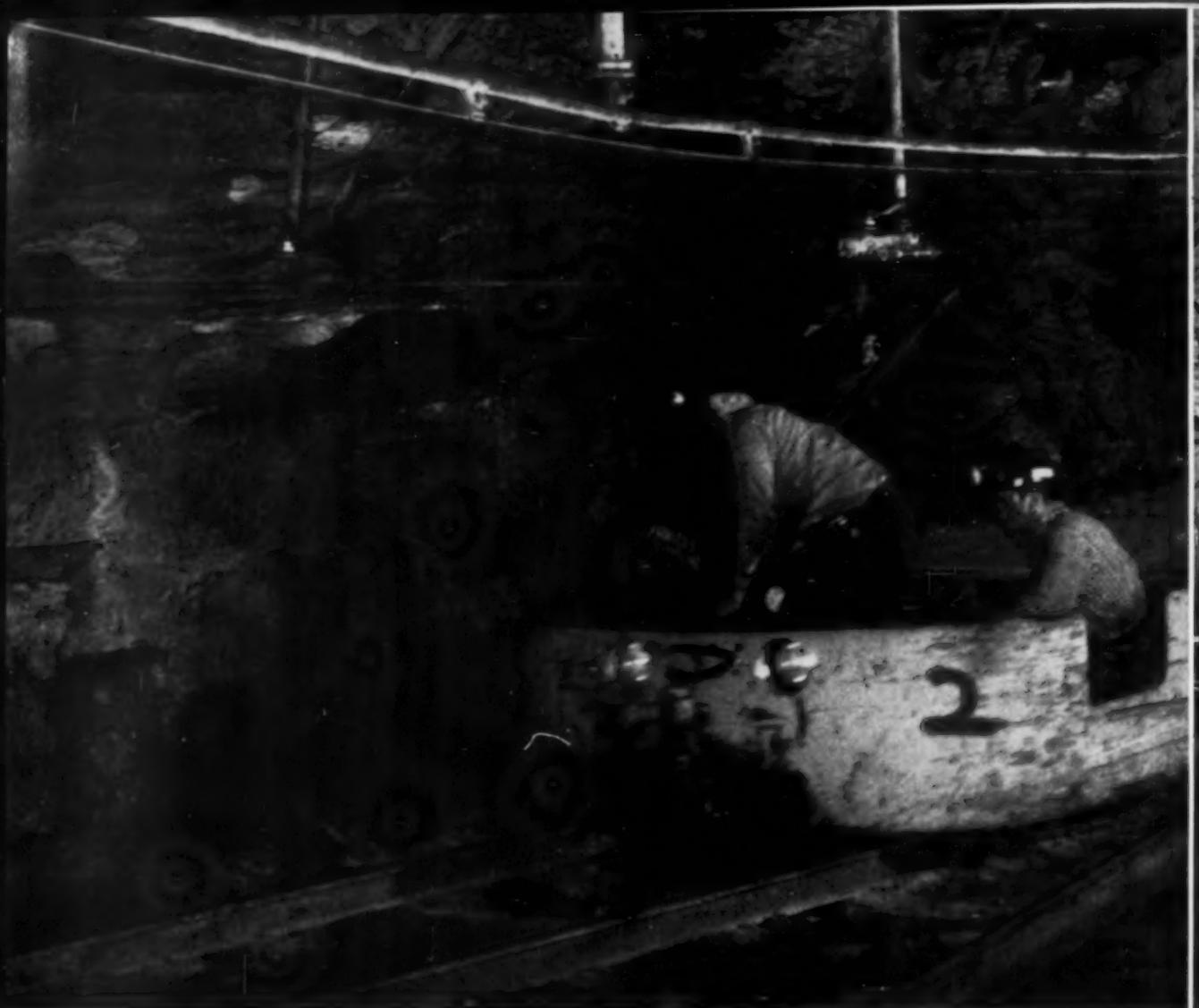
**SOME YIELDING**—Though the low rate of operation has resulted in a major increase in price pressure, a check of published quotations would indicate little effect. In fact, such quotations indicate an actual increase in prices on steam sizes from certain producing.

It does not reflect discredit on these published quotations, which basically reflect what producers would like to sell for, to note that there has been some softening in the structure. The noteworthy fact is that there has been no reduction stampede, nor does it appear likely that there will be.

**TROUBLED OIL**—Though it cannot really be described as in serious difficulties the oil industry also is suffering from problems growing out of the depression, as well as out of attempts to settle its import level. Trouble for oil, however, does not necessarily mean smoother sailing for coal. Oil has already cut its prices on both light and heavy grades, and might decide to go back into the heavy fuel market via this route. So far, however, this is only a possibility, rather than a probability.

Footnote on gas: It still goes along, even if not quite as merrily as in the past.

**REYNOLDS BUYS**—The depression in western coal fields far antedated that now prevailing in the East as a result of the West bearing the full brunt of competition from cheap oil and gas. But signs that this competition is losing some of its force are multiplying. They include plans for both utility stations and char and chemical plants. Now Reynolds Metals has exercised its options on large coal reserves in the Lake DeSmet area of northeastern Wyoming. There are no announced plans for immediate development, but the purchase naturally ranks as another encouraging omen for the coal industry of the West, which has had more than its share of the lumps.



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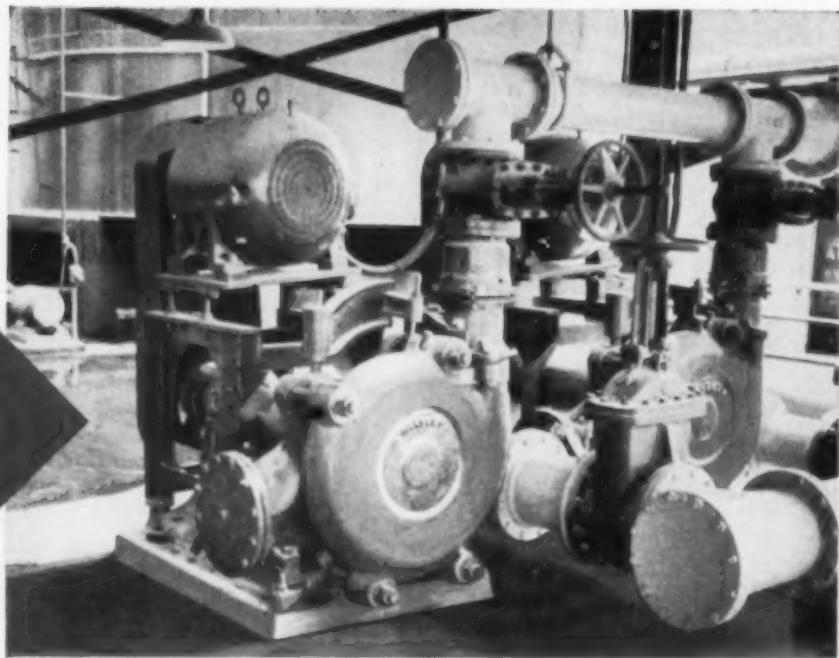
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## This Month in Coal Age—Cont'd

long-range trend in natural gas economics. It is also shown by continued promise in the search for low-cost methods of converting coal to high-Btu gas. Among the most promising methods are the methanation of synthesis gas and the direct hydrogenation of pretreated coal.

**Features**—Process diagrams; possible roles for nuclear energy; "On Tap for Gas: Two Billion Tons of Coal."

## Foremen's Forum ..... p. 132

Production foremen can become proficient in observing the cycle of operations in their sections to search for gaps which can be filled by properly-evaluated new purchases.

## Operating Ideas ..... p. 136

Roller conveyor solves problem; how to straighten trolley wire; adjustable stand for armature work.

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## This Month in Mining Practice

**HEADED UNDERGROUND?**—The first of the U.S.-designed permissible locomotives went to a mine in 1951 but never got inside. Reasons? Among others, the changing of the West Virginia mine law to specifically bar such equipment. Now, that bar has been removed from the law, leaving elimination of an earlier bar incorporated in the federal mine safety code as the only remaining step to putting the unit to work at the job for which it was originally built—hauling coal underground. The betting is that the safety-code change is not too far off, which will mean that coal will have a new tool in its campaign to cut cost and promote safety. The diesel, of course, is not the answer to all problems but its advantages are definite and make it well worth considering when the roadblocks to its use underground are finally cleared.

**WHEELS STILL**—Though the alternatives include a variety of devices up to and including pipelines, the wheeled car, like the wheeled prime mover, continues to hold a large share of the coal transportation business underground, face as well as elsewhere. Now, some of the limitations of the second ranking type of car in numbers, the shuttle unit, have been eased by putting a joint in its middle. For details, see the Equipment News section of this issue. Thus, though developments in extensible and bridge conveyors are increasing their penetration into the face-haulage field, the increased capacity and flexibility of new-design shuttle cars, supplemented by new forms of power (AC and torque-converter) are keeping them very much in the face-transportation picture.

**INJECTION CHARGING**—Being one of the most-promising of possible cost-reduction directions in stripping, overburden preparation in all its phases continues to receive a big share of operator and supply and equipment-builder attention. The result has been a series of major advances, starting with drilling and taking in all other operations. Now comes injection charging of horizontal holes, presently undergoing field test. Charging, in fact, remains about one of the last operations on a manual basis for a number of reasons, one being the lack of suitable equipment. But if mechanical charging can be developed to take its place alongside mechanical stemming, a close approach to the ultimate in efficiency will have been achieved in these particular strip-mining operations.

**MORE ON ACID**—A feature of this column last month was a brief outline of the implications of the new policy of the Ohio River Valley Sanitary Water Commission indicating that the commission expects to require action to reduce or eliminate acid discharge to streams on the ground that practical remedies are now available. The degree of success naturally will reflect the efficacy of these remedies. Underground, they include pumping water to the surface immediately to prevent prolonged exposure and acid pickup. But there are other acid sources, including refuse dumps on the surface. A new idea is crushing refuse fine and storing it in ponds. Initial results are said to be very promising in reducing acid discharge.

# The Coal Commentator

## Best Bargain

One thing, at least, is outstanding about developments in fission and fusion—the brain sweat that is being devoted to getting electric power from them.

Newest idea involves the underground explosion so prominent in the public prints a few weeks ago. Some money, in fact, is being spent in exploring the suggestion that deep holes be drilled and bombs exploded at the bottom. After the explosions, water would be run into the chambers to be turned into steam by the heat of the walls. When the pressure dropped, another bomb would be lowered and set off.

Thus the drive to substitute nuclear reaction for conventional fuels takes a new direction. The big problem for the nuclear researchers and developers, however, remains that of getting the cost of the final power down to a competitive level. Nothing yet indicates that competition will be possible in the United States in the near future. In fact, the possible date is still years away, if not decades.

Coal therefore continues to be the electric utilities' best bargain. So says not only your commentator but also such authorities as *Electrical World* another McGraw-Hill publication, and its editor, Fischer Black. A bow to both.

## Basic Defense

Faithful readers of *Coal Age* will recall mention from time to time of ways and means of meeting the gas problem at the face, especially with continuous-mining equipment. Now comes a report on the "Conference on Methane Detection for Underground Machinery," recently held in Pittsburgh under the sponsorship of the U. S. Bureau of Mines.

Two major conclusions can be drawn from the proceedings. One is that the safety authorities are getting ready to put on even more pressure in this area. The second is that a great deal of work is being done on detectors and backup auxiliaries, including equipment to cut power off cables and equipment.

But above all, the conferees confirmed once again, the basic defense is good—really good—ventilation.

## Big Prize

The chemical raw-material market is one of the big prizes that coal has a fair chance of capturing in the future, along with the even bigger one of becoming suppliers of gas and gasoline on a major scale.

Gas and gasoline from coal, however, are

not yet competitive, though the gap continues to narrow. Pending arrival at competitive status, more and more progress is being made in tapping other chemical markets. Latest evidences are the actual startup of the Mountaineer Carbon plant of Pitt Consol, soon to be Consol alone in a return to the old and respected name of the progenitor organization, Consolidation Coal Co., and the announcement of plans for a char plant in southern Wyoming with a planned capacity of 1,000 tons per day. The Mountaineer plant will start on petroleum stock but eventually will get its raw material from coal.

These and other plants already built or planned are the progenitors of many others to come. Without gas and gasoline, coal as a chemical raw material may not reach tonnages as great as the utility and other industrial but the potential still is substantial. With gas and gasoline, the potential becomes tremendous.

## Key Ingredient

It's a safe bet that machines will be the main coal producers for many years to come in the United States. This by no means rules out, however, the adoption and growth of other methods. One of these other methods, pioneered by the Russians and finding increasing application abroad, is hydraulicking.

Hydraulicking may never find application let alone wide use in American coal mining, though it is being successfully employed in producing gilsonite (*Coal Age*, November, 1957, p 80). However, some other equally unorthodox method may be developed in the future. Even if it isn't, the brain power being devoted to improving machines and methods means a continued increase in efficiency and in turn a more-and-more-favorable competitive position in the heavy fuel markets which coal has marked out as its own.

## 75 for Pocahontas

On March 13, 1883, the Norfolk & Western Ry. hauled the first car of coal out of Pocahontas, Va. Thus, on March 13, 1958, the Pocahontas Coal field passed its 75th birthday. In that 75 years, annual tonnage has grown from a little over 100,000 to over 4 million. The original Pocahontas mine probably produced more wealth than any of history's gold mines, since it turned out over 44 million tons of high-grade metallurgical coal before it was exhausted in 1955.

The end, of course, is not yet for the Pocahontas field, which will continue in the front ranks of the low-volatile producers for many years to come. In fact, its next 75 years of service to the Nation could well exceed that of the first 75, thus continuing a record-breaking contribution.



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**Relocating 1.9 miles of U.S. 40**, east of Flintstone, Maryland, Central Pennsylvania Quarry, Stripping, and Construction Co. is moving 1,200,000 cu. yd.—90% of it rock—with five International 95 Payhaulers!

The terrain requires the deepest cut (146 feet), and highest fill (150 feet), in Maryland. The haul is 4,000 feet, with dangerous downgrades exceeding 25%.

Their Payhauler fleet is operating beside competitive haulers down the same steep haul-road. This permits accurate ton-for-ton, and penny-for-penny performance comparisons.

"**Operators particularly like '95'** operating ease, riding comfort, and maneuverability," states Job Superintendent Smith. No wonder! Controls are conveniently located. Modern power steering reduces muscle strain! Shock-swallowing seat gives "club car" riding ease!

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"The '95's have cut costs of hauling large payloads because Torqmatic braking has cut delivery time in half over the other machines." A fully-loaded Payhauler can go down the steep grades much faster than a conventionally-braked hauler. With complete safety, too!

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# TD-24's cut shovel - ...beat other crawlers on

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**Problem** To remove 50 feet of overburden of shot rock, slate, and sandstone material from a 45-inch coal seam, at lowest possible cost.

**Objectives** To "tie-in" big shovel and big crawler production. To avoid rehandling of overburden by the big shovel. To take advantage of the profitable "edge" each machine offers in its own operating field.

**Profitable solution** The giant shovel first moves overburden to full boom length and dumps it. Then the Planet Power-steered TD-24 dozes the material 100 feet to the spoil area.

The TD-24 saves 50% of a big shovel's time by removing shovel-dug overburden so the shovel can make the 45-foot-wide exposure cut without rehandling spoil. Century Mining Company, Inc., Matoaka, W. Va. has two big shovels, each teamed with a TD-24, using this method!

**User comments** By Century Operator Richard McComas: "TD-24 Planet Power steering keeps a full blade load in a turn, always delivering maximum yardage." By Century Superintendent James Creaturo: "We are averaging 3,500 hours on TD-24 track chains and rollers plus low over-all maintenance, in extremely adverse conditions. The TD-24 beats any other crawler we've used for long life."

**Prove what it means** to command exclusive TD-24 Planet Power steering with *full-time "live"* power on both tracks for big-yardage overburden dozing. Compare TD-24 tough-job durability to anything else on tracks! See your International Construction Equipment Distributor for a demonstration!



**International  
Construction  
Equipment**

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment.



**- stripping time 50%  
long track life, low upkeep**



# Nothing gets by

Automatic end-point testing

device developed by

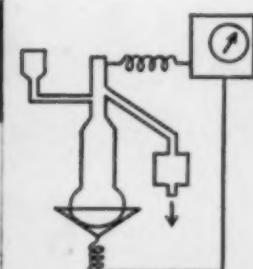
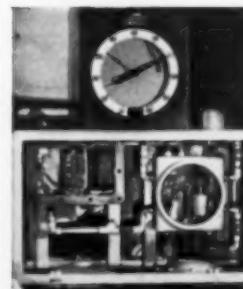
Standard Oil research men

makes certain of the  
uniform quality of gasoline and  
diesel fuel delivered to you.

Scientists at Standard Oil never stop in their drive to improve and then improve again the uniform quality of the petroleum products that bear the Standard Oil trade-mark. These engineering research scientists have now created wholly new instruments for performing near continuous physical analysis *automatically*.

One such instrument automatically performs the physical analysis that determines end-point. Using it, refineries maintain a continuous inspection of the temperature at which gasoline and diesel fuels are completely distilled. To you, this means that Standard is able to maintain a constant control over the uniformity and high quality of the gasoline and diesel fuels you use. It also means that Standard Oil power-producing petroleum products, with their constantly controlled end-point, burn uniformly, give you uniform high performance.

This is part of the research pay-out, the "something more" research builds into the products you buy from Standard. This is your return from Standard's investment in research. And now there are 48 district offices in the 15 Midwest and Rocky Mountain states to serve you. Call the one nearest you. **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**



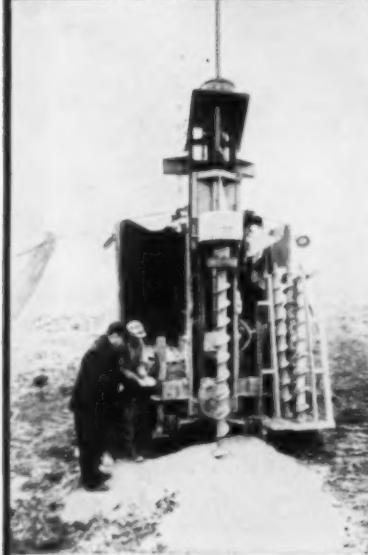
Automatic end-point tester works this way. A small sample is placed in an electrically heated flask. The temperature is measured and recorded during a heating cycle when distillation is accomplished. Distillate is condensed and drained, the flask temperature is lowered by introduction of the next sample, and the apparatus is ready for another test.

You expect more from **STANDARD** and get it!



# CUT MINING COSTS

WITH **HEAVY - RUGGED - POWERFUL**  
**McCARTHY AUGER DRILLS**



## VERTICAL

MODEL 106-24

*World's Fastest Heavy-Duty  
 Vertical Auger Drill*

Bores faster, deeper, larger dia. holes than any other auger drill. New gear reduction unit slows auger rotation for operation in hard rock formations. Drills 8" and 9" dia. holes readily in shale and sandstone formations, drills larger dia. holes up to 24" dia. in softer formations.

*Write for Bulletin M-100*

## FINGER-TIP CONTROL



Gives Desired Rotating Speed Of Auger

## HYDRAULIC FEED



Provides Any Speed Up To 8 Feet Per Minute Horizontal Feed Of Drill

## COAL RECOVERY

*"Walks" from hole to hole to auger high-quality Bonus Coal*

An Ohio miner removes 550 tons of coal in each 8-hour working day with this Model 14 36-42 x 12' McCarthy drill, operated by two men. He drills 42" dia. holes 14' deep. Auxiliary conveyor eliminates spillage at hole. It operates on either side of drill for working blind cut. Twelve different models of McCarthy Coal Recovery Drills mine low-cost "bonus coal."

*Write for Bulletin M-101 and M-102*



## HORIZONTAL MODEL 104

*Lowest Drilling Costs per foot, Self-Propelled or Truck-Mounted*

Bores up to 12" dia. holes to 150' depth faster, cheaper than any other horizontal drill. Requires less working space, saves many man-hours. . . operates easily in tight, hard-to-reach locations.

*Write for Bulletin M-105*

**THE SALEM TOOL CO.**

SOUTH ELLSWORTH AVENUE

SALEM, OHIO. U.S.A.





**Rugged and dependable cab-forward INTERNATIONAL Trucks** handle big loads just as easily on or off the highway. This tandem-axle model measures only 96½ inches from bumper-to-back-of-cab. Highly maneuverable, even on roughest terrain. Other INTERNATIONAL models from 22,000 to 60,000 lbs. GVW.

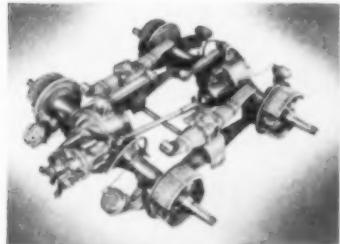
**You can carry a 6-man crew and a load in the new 4-wheel-drive INTERNATIONAL Travelette.** Two full width seats, three doors, and a choice of bodies up to 7-feet are combined in one unit to save you dual expense of a car and a pickup. Also available with conventional drive.



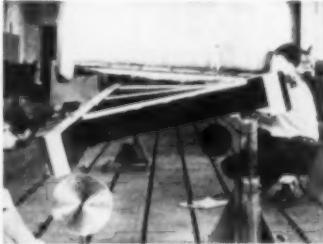
# INTERNATIONAL TRUCKS

# They can take it!

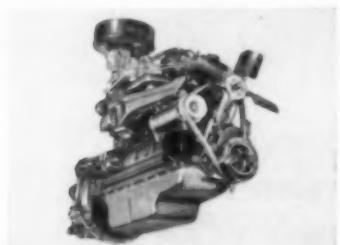
*Just one reason why you'll find  
International Trucks cost least to own!*



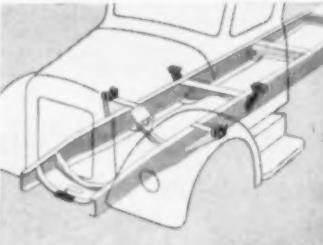
**Sure-traction tandems** carry heaviest loads dependably and smoothly over roughest terrain. They last longer.



**Superior-strength Steel-Flex frames** are test-proven to combine extra durability with proper flexibility.



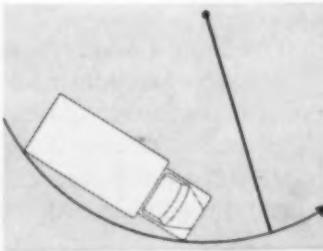
**Powerful gasoline or LPG "sixes"** develop more usable power and high net torque with fuel-saving economy.



**Rubber-insulated cab mountings** protect driver from hardest jolts and bounces. Cabs last longer.



**Power steering** takes strain off driver, yet leaves the feel of the road in his hands. Optional on all models.



**Easy to handle anywhere** because of short turning circle, overall clearance, and minimum overhang.

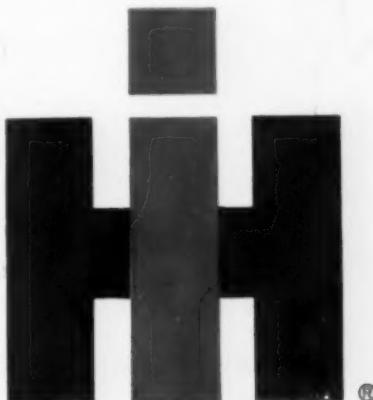
**Coal field operation** can be rough on trucks and rougher still on the truck owner's pocketbook. That's why more and more truck buyers are using rugged INTERNATIONAL Cab-Forward Trucks.

INTERNATIONAL cab-forwards are ready and able to stand up to any job. They save you money on maintenance and replacement parts. And when an INTERNATIONAL reaches the maximum repairable limit, you can bet it's given more service than any other truck made.

In the fields or on the highway, INTERNATIONAL cab-forwards are easy to handle. High-torque, low RPM engines cut your operating costs with every piston stroke. Purchase price is low, too.

Find out *all* the reasons why INTERNATIONAL Trucks cost least to own!\* See your INTERNATIONAL Dealer today! He'll help you select a durable INTERNATIONAL Cab-Forward Truck—a truck that's hard to beat and harder to beat up, anywhere!

\*Signed statements in our files, from fleet owners throughout the U.S., back up this statement.



INTERNATIONAL HARVESTER COMPANY, CHICAGO  
Motor Trucks • Crawler Tractors  
Construction Equipment • McCormick®  
Farm Equipment and Farmall® Tractors

## cost least to own!

# Our Page Dragline put us

## *Here's The Record:*

- **PAGE MACHINE REPLACES 2 SMALLER DRAGLINES AND 1 BULLDOZER**
- **REDUCED OPERATING PAYROLL 75%**
- **REDUCED FUEL CONSUMPTION 10%**
- **INCREASED COAL PRODUCTION 75.6%**



Adams-Mills' Page Automatic Bucket, digging in tough rock, shale and clay, produces maximum yardage on every swing.

### **PAGE DRAGLINE REVERSES PROFIT DOWNTREND . . . PAYS FOR ITSELF IN TWO YEARS**

Adams-Mills Coal Co. faced the common problem — rising labor, fuel, and maintenance costs, coupled with slow inefficient stripping operations.

Operating 2 draglines in the 1½ to 2½ yd. class, the company found their machines required considerable dozer assistance and that too much re-handling was necessary because their machines were limited to a 35 ft. cover. A single Page 721, 7 yd. capacity machine, equipped with a 125 ft. boom replaced the 2 machines. The big increase in production and sharp slash in costs was immediately apparent after the Page Dragline went to work. In a very short time, Adams-Mills found themselves "back in the coal business" . . . making a profit, and are now considering the purchase of another Page Dragline to enlarge operations.

*Write for complete Catalog WDSD-155.*

# back in the Coal Business

... ADAMS-MILLS COAL CO.



105-

**SPECIAL AUTOMATICS  
DESIGNED FOR JOB  
PLAY IMPORTANT PART IN  
SUCCESSFUL OPERATION**

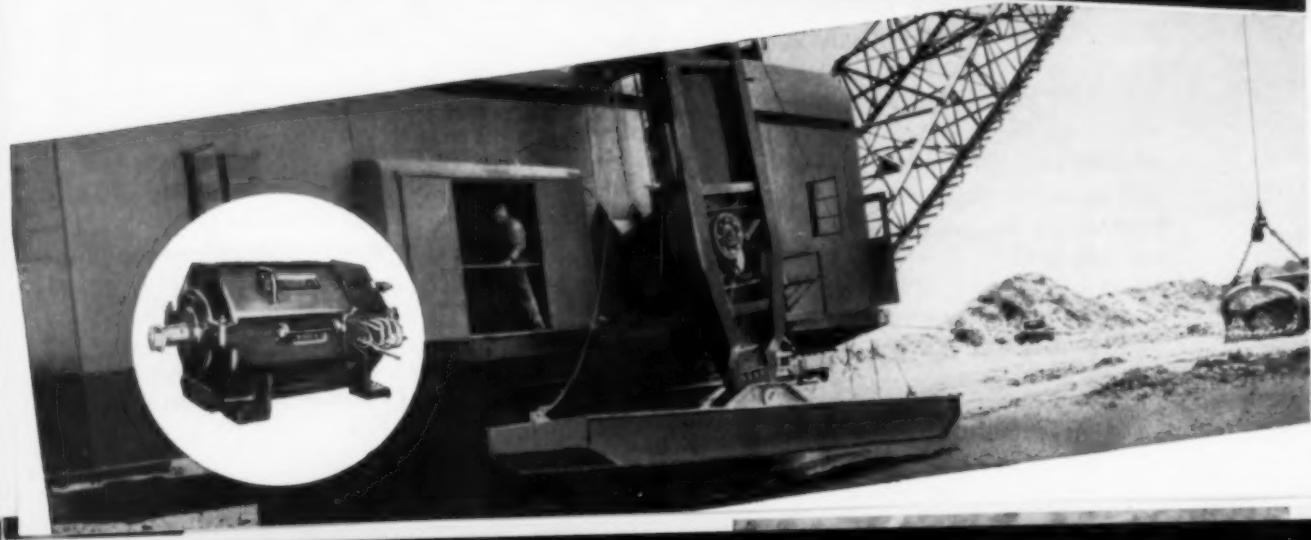
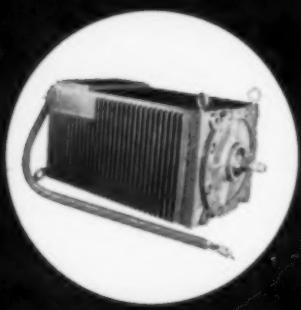
A big factor in Adams-Mills' success are their specially designed 7 yd. Page Automatic buckets — the bucket that loads faster, handles easier and produces more yardage per shift than any other bucket. Adams-Mills' operators like the automatic digging action of their buckets because they don't have to jockey and drag it to the fairlead to get a full load. Page Automatic Buckets are designed and built with an exclusive digging action that gets a full load in 1 to 3 bucket lengths . . . and because they don't have to be banged and abused to get maximum loads, Page Buckets last longer.

To get more production from your dragline machines, switch to Page Buckets. They're guaranteed to outperform any other bucket on the market. Write for Bulletin B57.



**Page**  
Automatic Dragline  
Buckets  
Walking Draglines

*If it's a PAGE... It DIGS*  
PAGE ENGINEERING COMPANY  
CLEARING POST OFFICE  
CHICAGO 38, ILLINOIS



# AC and DC

**Westinghouse motors are job-proved  
for all mining applications**

Regardless of whether you need a-c or d-c motors . . . regardless of the particular application . . . you'll find there's a Westinghouse motor to do the job . . . a motor which has proved itself time and again for rugged dependability and long operating life.

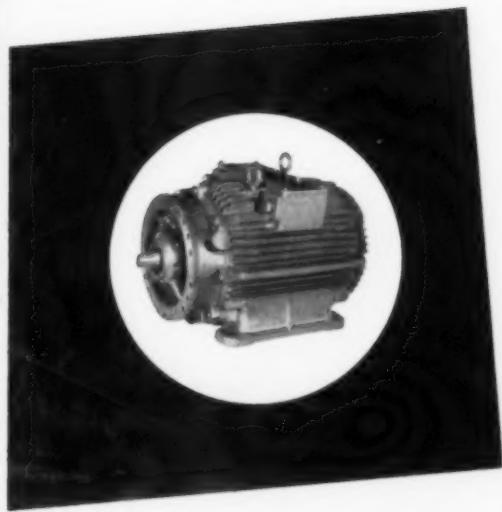
Combining the most modern materials with proven dependability and durability, Westinghouse motors will help you increase production through more efficient service . . . will help you decrease capital investment by giving you many extra years of reliable performance.

Westinghouse motors . . . either a-c or d-c . . . are available in all ratings, mountings, enclosures . . . standard or special design. Prompt delivery is backed by expert application and service-engineering assistance.

For complete information, contact your nearby Westinghouse representative. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J-22120

**YOU CAN BE SURE...IF IT'S Westinghouse** 



## KOEHRING WORK CAPACITY in action...



**Swings a big bucket** — Notice the size of this dragline, stripping a coal seam in an Eastern mine (below). It's the big Koehring 1205 — and handles 3 to 4-yard bucket, depending on weight of materials. Boom lengths: 60 to 170 feet. This big-capacity stripper also converts to 3-yard shovel. High-lift model has a 3-yard dipper on 40-foot shovel boom — or a 2½-yard dipper on 50-foot shovel boom.



**21.5 mph Cruiser®** — One man controls all operations, one engine supplies all power for work and travel on Koehring 205 Cruiser crane. There's a full range of low working speeds up to 7 mph — plus travel speeds up to 21.5 mph. It has smooth torque-converter drive, power steering, 27½-foot turn radius, 30% gradability. Usefulness is unlimited in mines, pits, and quarries. 205 Cruiser lifts up to 15 tons — handles ½ to ¾-yard clamshell or dragline buckets on a wide work radius — converts to ½-yard shovel or hoe.



**Ship to shore** — A pair of Koehring 405 clamshell cranes, mounted on a Great Lakes dredge — one of the world's largest — solved the problem of transferring sand from the ship's hold to shore. With this system, approximately 4,500 tons of sand are unloaded in 6 hours. Crane in foreground dumps into a Johnson Lo-Bin, mounted on flanged wheels. Lo-Bin travels along track, transports sand to a swinging, boom-type conveyor, which stockpiles it at dockside. On clamshell work, Koehring 405 handles 1 to 1½-yd. buckets. Check its other capacities in chart on opposite page.

**KOEHRING** DIVISION OF KOEHRING COMPANY, Milwaukee 16, Wis.



Here are some figures that will interest you:

KOEHRING MODEL	SIZE DIPPER	LIFT CAPACITIES	
205 CRAWLER	1/2-Yd.	20,000 lbs.	at 10-ft. radius
205 ON RUBBER	1/2-Yd.	30,000 lbs.	at 12-ft. radius
305 CRAWLER	3/4-Yd.	30,000 lbs.	at 12-ft. radius
305 ON RUBBER	3/4-Yd.	50,000 lbs.	at 10-ft. radius
405 CRAWLER	1-Yd.	40,000 lbs.	at 12-ft. radius
445 ON RUBBER	(Crane only)	90,000 lbs.	at 15 ft. radius
605 CRAWLER	1 1/2-Yds.	72,300 lbs.	at 12-ft. radius
805 CRAWLER	2-Yds.	104,200 lbs.	at 12-ft. radius
1205 CRAWLER	3-Yds.	190,000 lbs.	at 12-ft. radius



Want more information?

See Koehring distributor.

R760

**In heavy rock** — Owner of this Southern mine needed a heavy-duty shovel to strip rocky overburden — picked a Koehring  $\frac{3}{4}$ -yard 305 for the job. Its powerful digging crowd, and rugged strength of deep-section boom and dual dipper sticks, proved more than a match for the heavy rock. Yet, in work like this, 90% power-assist on main drum clutches gives operator a light lever-pull and sensitive "feel" of load. Power, strength, stability as a shovel increase the 305's work capacity with all attachments. For proof, check its lift ratings (at left).

# News Roundup

## Great Lakes To Atlantic By Ship

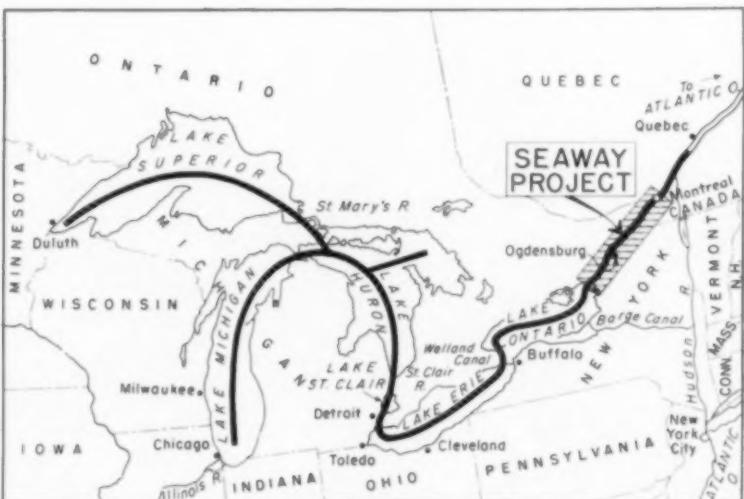
In July the United States opens her part of the St. Lawrence Seaway. Next year Canada will complete the new route by opening her sections.

The St. Lawrence Seaway is nearing completion. For over 100 yr Canada has operated shallow-draft canals and locks on the winding river between Montreal and Lake Ontario. Only cargo boats with capacities of 3,000 tons or less have been able to navigate the outdated canals.

In July of this year, 41 yr after Congressman Betrand H. Snell filed the first bill for navigation and power facilities on the St. Lawrence, the United States will open her two locks at Massena and Cornwall, New York. In July of 1959, Canada will celebrate royally the opening of her many locks and canals. Total cost? Well over \$300 million.

**Significance**—The completion means that lake ships with carrying capacities up to 35,000 tons and ocean vessels carrying as much as 8,000 tons will be able to travel from Duluth on the western side of Lake Superior to Montreal and on down to the Atlantic. The Seaway Commission expects that 30 to 33 million tons of cargo will pass through the new route the first year of operation.

**Geography**—To understand what the Seaway will mean to shipping, industry and coal, one should know about its geography and construction. From the towering Lake Superior plateau the channel drops a precipitous 600 ft on its 2,700-mi journey down to the sea. Seaway engineers have accomplished this feat with a system of locks and canals that maintains a minimum depth of 27 ft the entire way. Almost half the distance is lake water with depths of 75 ft or more prevailing. Minor steps



have been taken to connect the lakes in such a way that big ships may pass through. They are:

1. The St. Mary's River (67 mi) between Lake Superior and Lake Huron. Engineers have dredged it and built one lock to attain the proper depth. The channel between Lake Michigan and Lake Huron was already adequate.

2. The St. Clair River (38 mi) between Lake Huron and Lake Erie. It has required dredging.

3. The Welland Canal (28 mi) between Lake Erie and Lake Ontario. It has required dredging.

**Main Project**—The heart of the work has been the 188-mi stretch from Lake Ontario to Montreal. This engineering job has been extremely difficult because of rapids and different depths between Lake Ontario and the Atlantic. From Lake Ontario to Ogdensburg, the Thousand Islands section (68 mi), water

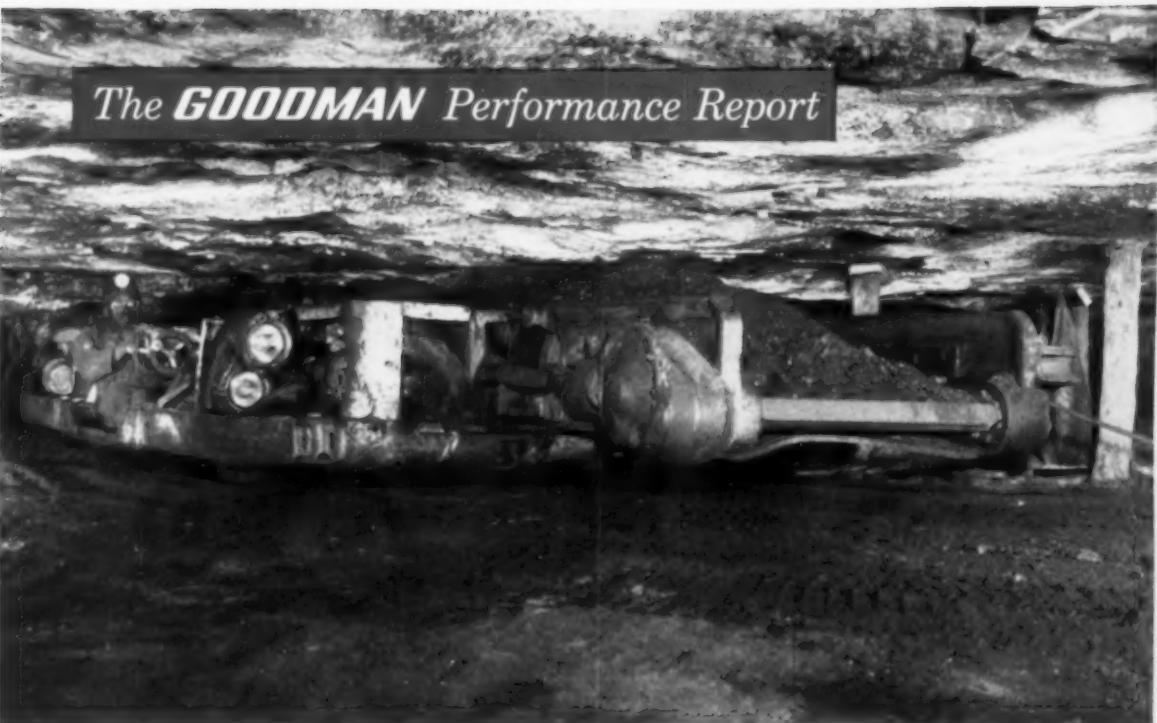
depth was 21 ft. This section dropped off into the International Rapids section east of Ogdensburg (44 mi) with a depth of only 14 ft and tricky currents. Seaway engineers have overcome these problems with locks and canals, and the St. Lawrence Power Project, a separate organization, has built a 940,000-kw power plant at Massena, N. Y. Finally, come three lake sections which have required a complex lock and canal system to bring the route to tidewater of 35 ft, east of Montreal. Three depths, white water and other natural barriers . . . formidable problems overcome. Thus, the frontier of the Great Lakes has been pushed 600 mi or more eastward into the lower St. Lawrence gulf coast.

**Economic Significance**—Eight states border on the Great Lakes and Seaway, Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania and New York. (Some experts theorize that nine other states are tributary to the former states. These tributary states are Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Montana, Wyoming and Colorado.) History, these experts say, shows that transportation has oftentimes spurred the growth of industry. Thus, they assert, as new loading points develop along the Seaway route, an expansion of industry in the border and tributary states may become a reality. For coal, this could mean increased tonnages.

**Metals**—But this sort of industrial growth does not seem as likely as the chance of booming activity in the im-

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## How to get Big Car Strength in low coal

There's one sure way . . . put Goodman low vein shuttle cars to work in your mine. For example, let's look at the 26" high Goodman Type 870 shown above. This tough little car has all the rugged structural strength expected only in big shuttle cars. Wheel units, conveyor chain and flights, gear reducers and electrical control parts are the same as those found in big Goodman cars — some are even interchangeable. The frame, including side plates, is a welded one-piece unit reinforced with heavy cross members. You don't have to worry about cracks or bends under severe conditions. The conveyor pan is  $\frac{3}{8}$ " steel plate with extra strong chain for pull-out type flights.

You get full-time efficiency from these big-little cars. All motors are rated 10 h.p. . . . Goodman designed and built with a high continuous rating for full-time peak performance. All use identical and interchangeable motor shells and armatures. The armatures last so long in hard service that one mine with four Goodman cars in operation since 1951 has yet to have one rewound. Another mine with 12 cars in service six years, has replaced only one set of coils.

Most important, the 870 carries a man-size pay load. A prominent low vein mine reports one Goodman to each 3-ton mine car—not three shut-

tle car loads to two mine cars as required where other makes are in use.

And for ease of handling, particularly in close quarters, the 870 can't be beat. 4-wheel power steering and disc type brakes greatly reduce operator fatigue and promote safety. Other standard Goodman features include 4-wheel positive drive for rough going, dual control in operator's cab, adjustable height discharge and U.S. Bureau of Mines Approval.

Your low coal operation can pay off. Call on the Goodman 870 for big car strength and performance . . . performance that will deliver profitable tonnages from face to haulage system. Available for AC or DC operation.

**GOODMAN**  
MANUFACTURING COMPANY

Halsted Street and 48th Place, Chicago 9, Illinois

CUTTING MACHINES • CONVEYORS • LOADERS  
SHUTTLE CARS • LOCOMOTIVES • CONTINUOUS MINERS

*Use Genuine Goodman Replacement Parts*

## News Roundup (Continued)

mediate St. Lawrence Valley. Electro-met and electro-chemical industries may spring up with a flourish along the St. Lawrence. Such large firms as Alcoa and Reynolds have reportedly been scouting and appraising the area. If such concentrated growth takes place it could generate a vast need for thermal power. Here is another possibility for coal.

**Coal to Canada**—It is estimated that by 1975 Canadian maritime provinces will need 4,500,000 tons of coal. Western Canada should require about 7,500,000 tons by that time and due to Canada's growing population, electric utilities are expected to consume 27,000,000 tons by around 1970. Neither Canada's gas industry, hydro-electric power, nor own coal producers will be able to fill this need, say Canadian economists. The new Seaway may be the vital link in an exchange of raw materials that could see a great deal of American coal helping to fill Canadian requirements of 61,000,000 tons by 1975.

**Overseas Market**—Some sources think there is a good chance for coal to move to Europe through the Seaway. Right now most of the coal going overseas comes from southern mines and is carried by rail to such southern ports as Newport News, Norfolk and Sewall's Point. It is suggested that if rates from the southern coal producing regions to loading points on the Great Lakes such as Toledo (Lake Erie) could be made competitive with rates from the southern coal regions to Atlantic coast ports, a route through the Seaway and overseas might be developed. Some observers even look for railroad rate wars in the future. Another possibility is that of establishing a transfer dock east of Montreal. With this system, lake boats on their way down for ore could carry coal to a transfer dock where the coal could be reloaded into ocean vessels. Such an arrangement would shorten the ocean trip to Europe by 500 to 800 mi, it is added. The possibility of coal producers in the Illinois-Indiana region getting into the foreign market exists, but is somewhat dubious because these areas turn out mostly steam coal while the European market is mainly for metallurgical coal. All in all, any of the possibilities depend largely on the level of Seaway tolls.

**Seaway Rates**—The canal authorities believe that they will be able to make toll rates attractive to coal producers and ship operators. This, they hope to do by amortizing the cost of the Seaway for a period of 30 yr. If they find that this amortization is not enough to enable them to set low rates, they may stretch it out for 50 yr, which would reflect on toll rates. All in all, some intriguing

possibilities exist for manufacturers and producers in states that have in the past been, in effect, landlocked.

There are numerous other theories on what the Seaway will mean. Some coal men are worried about the possibility of foreign oil coming into the Mid-West at low, low rates. Aside from all the speculation, the Seaway is a tribute to the joint efforts of the Canadian and American people and symbolizes a future of cooperation and understanding as well as an increased exchange of raw goods and manufactured products.

### Reynolds Buys Coal Land

**Company may build an aluminum reduction mill or a steam power plant.**

Reynolds Mining Co. now owns a lot of coal land in northern Wyoming. The firm recently used its option to buy 7,500 acres of land near Lake DeSmet from a Mrs. John E. Rice. The area, incidentally, includes the lake. Reynolds Mining is a subsidiary of Reynolds Metals Co., well known in the aluminum world.

**Thick Veins**—Experts have been do-

ing some exploratory drilling for Reynolds and they report that the area has one of the most concentrated coal deposits known. The average thickness of the seams is about 150 ft, but some test holes have burrowed down to more than 200 ft. The drilling experts go so far as to say it is the thickest coal vein in the Western Hemisphere, surpassed only by a deposit in the Orient.

**Two Choices**—The coal has a high water content and probably would be no good for commercial purposes. Therefore, there are two tasks Reynolds may follow. They may build either an aluminum reduction mill or a steam power plant on the site. Walter Rice, Reynolds Mining president, has stated that the property will be used for expansion of its primary aluminum capacity, but this statement doesn't split the dark curtain around the company's intent.

**Closer Look**—One tip off may be that Pacific Power & Light Co. has been working with Reynolds on plans for a steam power plant at Lake DeSmet. President Rice has said the power potential at Lake DeSmet is greater than the present total of installed power in the whole state. What's more, should Reynolds build a power plant there, it would be close to Pacific Power & Light's Casper-Billings transmission line that was completed last year.



### Clinchfield Builds Another Plant

**Coal plant at Clinchfield, Va., will have dual facilities.**

Link-Belt Co. is putting up one of the largest automated preparation plants in this country for Clinchfield Coal Co. The new plant will be called Moss No. 3. It will wash, dry and screen 1,500 tph of mine-run coal. Clinchfield Coal, a division of Pittston Co., already has Moss No. 2 that was completed by Link-

Belt in 1956, but it is smaller than the newly-planned layout.

**Eight Washers**—The new plant will use heavy-media separation for preparing metallurgical and steam coal. Dual facilities and stand-by equipment will enable workers to make repairs during regular shifts. There will be eight of the new Link-Belt tank-type, heavy-media washers. Four will serve as primary washers to get the highest-quality metal-



long-run power by Allis-Chalmers

**NOW... tube-type MOTORS  
with capsule-mounted  
split-sleeve bearings**

Now the most effective air cooling system ever designed for larger TEFC motors has been combined with the accessibility of capsule-mounted split-sleeve bearings. *Both* of these user benefits are available in a newly designed line of Allis-Chalmers tube-type motors.

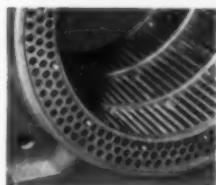
**Indoors or outdoors**, these Allis-Chalmers motors are ideal for moist, corrosive and hazardous atmospheres. Contact your A-C district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



A-5500

**ALLIS-CHALMERS**

**Capsule mountings** permit access to bearings without exposing vital electrical parts. This design is available for directly coupled drives; ball or roller bearings also available.



**Cooling system** works like this: Air circulated within the motor by internal fans transfers motor heat to a nest of tubes around the stator. External fans constantly blow cool air through the tubes to absorb and remove heat.



## News Roundup (Continued)

lurgical coal and maximum recovery from raw-coal feed, while the other four machines will be used as secondary washers to recover steam coal from the refuse of the metallurgical washers.

**Turnover Belt**—The new plant has several unusual features, one of which is a filtration system for fine coal and fine refuse. The plant needs a minimum amount of makeup water, and prevention of stream pollution will be accomplished by filtering, treating and re-using the plant water. Another idea is a 2,500-ft turn-over slope belt conveyor to carry refuse from the plant to a nearby mountain top for disposal. The belt turns over after discharging the material and returns with the top side of the belt up. This turning prevents building up of material on the underside of the belt and rollers, over which the belt passes.

**Coal Delivery**—The Clinchfield mine sits on a large and valuable reserve of virgin metallurgical coal, reports a spokesman for the firm. In most areas the seam averages 10 to 18 ft in thickness. A railroad will deliver coal from the mine to Moss No. 3. The distance is about 7 mi, but this is only possible because the railroad will burrow 8,500 ft through a mountain tunnel that is under construction. To go around the mountain would add another 30 mi to the trip. Link-Belt cites the new plant as further evidence of the nation's need for coal for metallurgical coke and electrical energy. Link-Belt is an old hand in the field, having built coal preparation plants since 1893.

### Little Aid on Oil

The Administration's latest effort to help domestic oil producers and coal men is receiving biting comment from many sides. President Eisenhower has approved a Cabinet committee recommendation that crude oil imports in the area east of the Rockies be limited to 12% of domestic production in the area. That is 713,000 bbl per day, about 60,000 bbl per day less than a previous goal that Congress set.

What's more, the program is "voluntary," and opponents of foreign oil are not happy about that. The fact that the President has signed an order aimed at cutting Pentagon purchases of petroleum products from offenders offers little consolation to domestic oil men. They have lost faith in "voluntary" solution and say that the cut is insufficient . . . what they want are mandatory controls.

Reports indicate that the coal and fluorspar industries are going to join 22 oil producing associations in backing a bill introduced by Rep. Frank Ikard (D-Tex.), a member of the House Ways & Means Committee. Ikard's bill



**NEW ATTICA HIGH SCHOOL**, heated by radiant ceiling heat with automatic anthracite equipment, is the center of attraction at the New York State Fuel Merchants Association Convention at the Waldorf-Astoria Hotel, New York City. Everett J. Decker (right) president of Peterson & Packer Coal Co., points to a description of the modern school. Equipment there handles coal and ash pneumatically. At left is James H. Pierce, president, Coaldale Mining Co., and center is William Steen, Unloading Corp., president of the Fuel Merchants Association.

would direct the President to limit imports of products and crude to a 16.6% ration. The same setup would apply to fluorspar products. The bill suggests that the President have the power to allocate the quota among supplying countries.

### Test Mining Machine

The Bureau of Mines will test a new continuous mining machine that has been successfully used in semi-hard coal in Europe. The machine is called an Anderton-type drum-cutter-loader, and the bureau wants to have the device operating in an anthracite mine near Wilkes-Barre, Pa., by midsummer.

The **drum-cutter-loader** is one of three machines the Bureau will use in a full-production-scale longwall mining experiment to be conducted in cooperation with Glen Alden Corp. A revolving drum studded with steel teeth is the key feature of the European machine. The drum is started in an opening at one end of a long wall of coal. Then, as the machine travels parallel to the coal face on an armored chain conveyor, the drum moves at right angles to the face. The teeth of the drum chew out coal to a depth of two or more feet into the face and a height of 30 in. Hydraulic jacks hold the machine and conveyor against the coal face as it travels.

The machine's cutting action may throw much coal onto the conveyor

which will carry it off. Any that falls short will be pushed onto the conveyor by a plow-like scoop, also part of the device, that goes to work when the machine is returned for a second cut. Coal above the bottom cut is expected to fall of its own weight. However, Bureau engineers say it may be necessary to drill this coal to hasten falling.

### Award to Coal Age

**Coal Age** has been awarded the National Safety Council's Public Interest Award for 1957. The noncompetitive award is made annually to public information media for exceptional service to safety. Ned H. Dearborn, president of the National Safety Council, said that a review of the 1957 Public Interest Award entries shows beyond question that mass communication media contributed greatly to the safety of the public and the prevention of accidental deaths.

### First Aid Contest

The Fayette Raleigh Wyoming First Aid League has set August 16 as the date of the third annual first aid meet. The tri-county league was organized in 1956. It is an idea hit upon by coal

(Continued on p 62)

# Coal-hungry machines need Amoco Mine Lubricants!



Keep heavy-duty machines reaching for coal day after day, week after week . . . with Amoco Mine Lubricants. They're refined to the exact needs of today's highly specialized equipment and offer the best insurance against costly down-time.

Result: you get a bigger return on your lubrication dollar! The Amoco line is complete, takes in every requirement in strip or deep mining—from leaded lubricants to the exact oil required for diesel engines. Call your Amoco representative today!

**AMOCO**  
**LUBRICANTS**  
**FOR MINE MACHINERY**



HIGHER QUALITY...FOR BETTER LUBRICATION...AT LOWER COST

## People in Coal



### Job to Do

A SHORT TIME AGO Henry G. Schmidt became operator-trustee on the Board of Trustees of the United Mine Workers of America Welfare & Retirement Fund. He will tackle the job without pay. Charles A. Owen held the position before Mr. Schmidt, but Mr. Owen passed away last Fall.

Mr. Schmidt celebrated his 58th birthday last month. He has enjoyed considerable success in his 58 yr. He is president of North American Coal Corp., which has jumped from 34th to 9th place among coal producers since Mr. Schmidt took over the helm in 1942. He is president of the Ohio Coal Association and on the Board of Directors & Executive Committee of the Bituminous Coal Operator's Association.

Henry Schmidt has a Mechanical Engineering degree from the University of Kansas. He began working with Goodyear Tire & Rubber Co. as a steam engineer in 1927. It didn't take him long to rise to manager of the engineering staff of Goodyear. In that position he headed hundreds of design and construction projects. Later he put his mind to modernizing Wheeling Township Coal Co., a wholly-owned subsidiary of Goodyear.

Married and living in Cleveland, Mr. Schmidt likes shooting. He belongs to the Shaker Heights Country Club, the Union Club of Cleveland, and the Fort Henry Club of Wheeling, W. Va. *Coal Age* wishes him well in his new appointment.

Metallurgical & Petroleum Engineers, and for many years has been a member of the board of directors of BCR.

**M. O. Evans**, chief engineer of Republic Steel Corp's mining division, has retired after more than 40 yr of service in coal mine work. Mr. Evans started his career in mining in the lower Ohio Valley coal mines in 1915. He moved to Fayette County, Pa., as mine electrician for Republic's Martin mine in 1919 and the following year was transferred to the firm's Russellton, Pa., mine as assistant chief electrician. In 1943 he was appointed assistant district manager of the Northern coal mines and in 1947 was promoted to chief engineer of the Mining Div. at the company's general offices in Cleveland.

**S. P. Curtis** has been named chief engineer, Central Operations—steel and coal, for United States Steel Corp. Mr. Curtis graduated from Purdue University in 1935 with a BS degree. He started working for U. S. Steel in 1941 as an expeditor in the engineering department of the Gary steel works. He devoted much effort to building up Fairless works, a modern steel plant at Morrisville, Pa., where he was chief engineer until this appointment.

**Mathew Blair** has been promoted to safety director at the Vesta-Shannopin Coal Div. of Jones & Laughlin Steel Corp. Mr. Blair has been superintendent of the division's Vesta No. 5 mine. He

studied engineering at Penn State and at the University of Pittsburgh, then began his J&L service as a mine-car repairman in 1933.



**Coy L. South** is now a safety engineer with Bell & Zoller. Mr. South was with the U. S. Bureau of Mines since 1947 and has been Federal inspector for the past nine years. Prior to 1944 he was with Island Creek Coal Co. Married and father of three children, he is secretary-treasurer of Post No. 4 of the National Mine Rescue Association.

**William A. Fullarton**, assistant to the president of Pocahontas Fuel Co., is the

**Luther C. Campbell** has been awarded the 1958 Bituminous Coal Research award for outstanding leadership in the coal industry. Mr. Campbell, formerly vice president of Eastern Gas & Fuel, is now a mining consultant. The award, designed to stimulate technical progress in the bituminous coal industry, honors BCR member-company representatives who have been leaders in contributing to the progress of industry-sponsored coal research. Mr. Campbell has served the coal industry for four terms as president of the National Coal Association. He is a former chairman of the Coal Div. of the American Mining Congress, a director of the American Institute of Mining,



**Big ropes for high-speed hoisting system.** The shaft served by these hoists goes into an iron-ore mine to a depth of 2200 ft. It is equipped with a man-and-materials cage and two high-speed 20-ton skips. The cage operates at 1450 ft per min; the skips at 2500 ft per min. An interesting feature of the shaft is its circular shape, designed to offer maximum resistance to rock pressure.

The hoists for cage and skips are rigged with Bethlehem ropes of the flattened-strand type. For the cage hoist (foreground), 1½-in. rope is required. The skip hoist uses the 2¼-in. size.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

*Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:*  
MINING • QUARRYING • CONSTRUCTION • EXCAVATING • PETROLEUM • LOGGING • MANUFACTURING

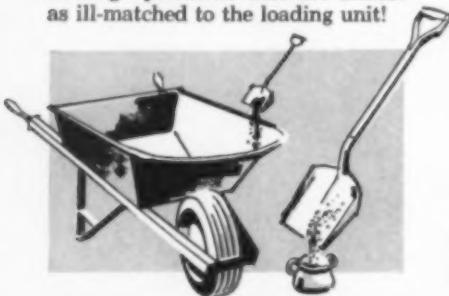


# How to select size and number of hauling units for your job

**I**t's not difficult to decide on the right size hauling equipment when you buy a complete fleet at the same time as your loading unit. However, this situation rarely occurs. Most of the time, because of existing equipment, there are 2 problems you face in determining the size of haulers to be purchased:

**FIRST** — New machines are usually bought to improve an existing hauling fleet — yet they must have travel speeds and capacities that will permit them to work efficiently with older haulers.

**SECOND** — New machines must fit ability of existing loading unit. You would not use a child's sand shovel to load a wheelbarrow . . . nor would you use a farmer's scoop shovel to fill a sugar bowl. These examples may seem absurd — but every day you can see hauling units on some earth-moving operations that are almost as ill-matched to the loading unit!



## If your haul units are too small

Major production losses are caused by use of hauling equipment too small in capacity. Each haul unit should hold at least 4 dippers or buckets of material from your loading unit. If they are too small for this, your loading unit is slowed down while waiting for frequent spotting of haul units.

## When haul units are too large

Inefficiency will likewise occur when your haulers are too large (where more than 8 to 10 dipper or bucket

loads are needed from loading unit). Over-sized haulers usually make the loading unit reach too far or move up too often in securing and dumping its load. Either condition causes wasted time for your loading rig, and excessive waiting time for the hauling unit next in line.

## Factors affecting number and size of haul units to be used

The production ability of each hauling unit . . . and the number required to keep maximum production moving from your loading unit . . . must be determined for each individual job. Factors to consider in regard to number and size of your haul units are:

1. Type of material being loaded.
2. Loading unit's maximum output potential.
3. Haul distance.
4. Conditions of haul — surface and grades.
5. Dump area conditions.
6. Mechanical efficiency of hauling units.
7. Maintenance and service facilities.

## Figure 60-minute hour for hauling units

In determining the number of haul units required, instead of figuring on the basis of a 50-minute production hour by your loading unit, estimate on a 60-minute hour. Undoubtedly, cases will arise where 50 minutes per hour will be the maximum output from your loader. If hauling units are determined on that basis, however, there will normally be increased waiting time — since your hauling-unit delays will seldom occur at the same time as those of the loading unit. And remember, it is impossible to haul out more material than the loading unit's maximum production capacity.

Any loading unit requires a time factor for moving into better loading

range for easier and faster digging. Also, a factor of time is always necessary for clean-up in front and on the sides of the loader, before it moves. However, usually this can be accomplished during wait periods for haul units. Except on the "perfect" job, there will always be some bunching of hauling units that will cause wait time for your loading unit.

## Use of standby hauling equipment

Insuring adequate hauling capacity is one more way of keeping your production rate near the maximum. The use of standby hauling equipment for emergencies is generally recommended. When not in operation, large size standby units represent a cost of not more than \$3.00 per hour for ownership cost. Say, for instance, your hauling fleet consists of 4 units, efficiently hauling 300 cu yd per hour. The loss of one would cut your production by 25% — or 75 cu yd for each hour of downtime. In such a case, the cost of a standby unit would be more than offset by the increase in yardage it could provide.

For example, 10% downtime on a 4-unit fleet for a 40-hour week is 16 hours. 16 hours production gained by a spare would be 1200 yards. Figure this gain against your \$120 per week for standby cost! You get a plus of 1200 yards production at a cost of only 10¢ a yard . . . in addition to further savings in any plant, or other processing operations slowed down by partial capacity during a hauling shortage. One cent per cubic yard cost of insurance for maximum output should be considered a very reasonable investment.

## How to figure load time

Loading units in the range of  $\frac{3}{8}$  to  $\frac{3}{4}$ -cu yd dipper size will normally complete a pass or cycle in 15 to 20



**"D"** Rear-Dump  
11 ton cap., 138 hp, 29.5 mph

**"C"** Rear-Dump  
22 ton cap., 210 hp, 28 mph

**"B"** Rear-Dump  
35 ton cap., 300 or 325 hp, 28.7 mph



seconds. Loaders varying from  $\frac{3}{4}$  to 2 cu yd will normally make a pass in 20 to 25 seconds; those from 2 to  $3\frac{1}{2}$  cu yd should produce a bucket or dipper full in 25 to 35 seconds. This pace can be maintained during the loading time. Therefore, the following formula will usually give your approximate loading time:

$$\frac{L \times C}{D \times 60} = LT$$

L = Hauling unit capacity in cu yd based on 3:1

C = Load time per dipper or bucket, in seconds

D = Dipper or bucket capacity in cu yd

LT = Load time in minutes

**Factors that affect production ability of the loading unit are:**

1. Type of material.
2. Its condition when being loaded.
3. Height of face for shovels, or distance of reach for draglines.
4. Depth of cut from which material is being taken by loading unit.

5. Distance of swing from loading point to spot where load is dumped into hauling unit.

**Proper position of haulers at loading unit**

For maximum loading efficiency, there should be a hauling unit under loader at all times. If possible, lay



out your jobs, so that one hauler is being loaded on one side of the loading unit while another is being spotted on the opposite side. Watch to keep loading within a 90° swing.

It is not intended to imply in any way that your hauling fleet should

be so large that numerous units are waiting for your loader to fill them. If hauling units are maintaining proper haul-road speeds, and loads are dumped promptly — yet extra units are standing by at the loading unit — then it is probable that unnecessary haulers are being operated. This, of course, assumes that procedure at your loading unit is effective.

**To insure success at your job avoid delay in any phase**

Overall phases of a hauling operation include:

1. Spotting time.
2. Actual load time.
3. Haul time.
4. Dump time.
5. Return time.

When all avoidable delay in each of these phases has been eliminated, the lowest cost per cubic yard for the material you handle will result.

For free reprints of this advertisement, write LeTourneau-Westinghouse Company, Peoria, Illinois. Please state quantity desired.

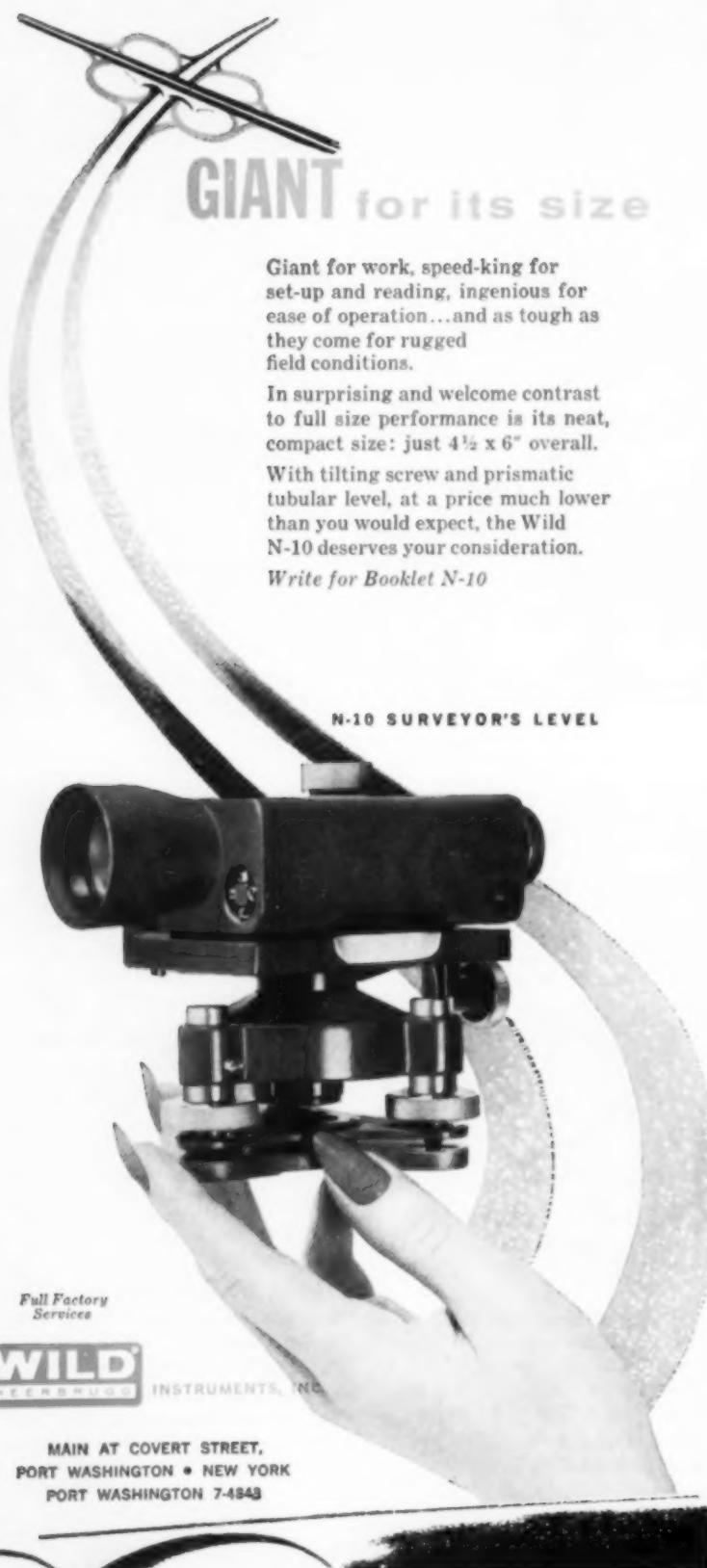
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**LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS**

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



## People in Coal (Continued)

new executive vice-president of the Low-Volatile Coal Exports Association, Inc. Mr. Fullarton has had wide experience in the coal industry including domestic production and sales as well as overseas marketing. He is a graduate of Dubuque University and holds a law degree from Loyola University. In 1949 he was named chief of the coal branch of the Economic Cooperation Administration with responsibility for coal exports under the Marshal Plan and for various foreign coal programs.

**Harry W. Bradbury** has been appointed Glen Alden executive vice president in charge of coal and **Harold B. Wickey** has been named vice president and executive officer to Bradbury. Mr. Bradbury and Mr. Wickey were officers of Lehigh Valley Industries, Inc., resigning recently from that firm. The new appointments stem from the pending merger of Glen Alden and List Industries, in which the latter company is the dominant shareholder. List's president, Albert A. List, has said, "We intend to stay in the coal business here." "The only reason we would leave the coal business would be if we were driven out." The latter remark, he indicated, referred to Glen Alden's tax problem.

**F. Stillman Elfred** has been elected chairman of the board of Peabody Coal Co. He retired only recently as senior vice president of Olin Mathieson Chemical Corp.

**O. G. Stewart** has been appointed executive engineer, mining, for Electro Metallurgical Co. He will be responsible for exploration, acquisition and management of coal lands, and will serve as mining consultant for operations and materials handling. His headquarters will be at Alloy, W. Va., near the company's Bell Creek coal mine. Mr. Stewart graduated from West Virginia University in 1921 with a degree in mining engineering, and received an MA from the University of Illinois in 1923. He began his career with Electromet in 1931 as a mine surveyor and engineer at the alloy plant and was made coal mine engineer in 1940. Electromet, a division of Union Carbide Corp., produces ferro-alloys and metals.

## Obituaries

**Ervin M. Baker**, 53, superintendent of Gibraltar Coal Corp. mine, passed away after suffering a heart attack at the mine. He was under treatment for a heart condition several months before. Mr. Baker was born in Pulaski County and went to work for Sinclair Coal Co. in 1934. Later he went with Ayrshire Collieries, and then back to Sinclair. He came to Gibraltar in 1954.



**JOY AC EQUIPMENT  
PROVED ROUND THE WORLD**

It all started back in 1913 when Joy shipped the first AC shortwall cutter to Tiomso, Norway. Through the years, much of the Joy equipment shipped overseas has been AC, to correspond with mining practices in various countries.

In the last 45 years, Joy AC machinery has gone to 26 states in this country and to 28 different countries abroad. These far-flung operations include the underground mining of almost every valuable mineral known to man.

**LET'S TAKE A TRIP**

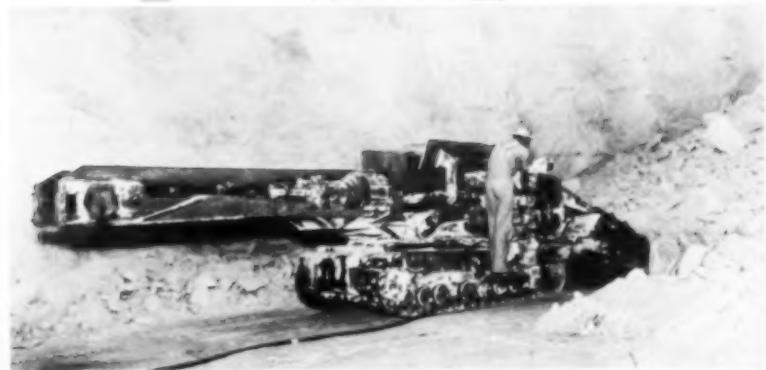


One of the earliest AC cutters crossing the face . . . Kenilworth, Utah.

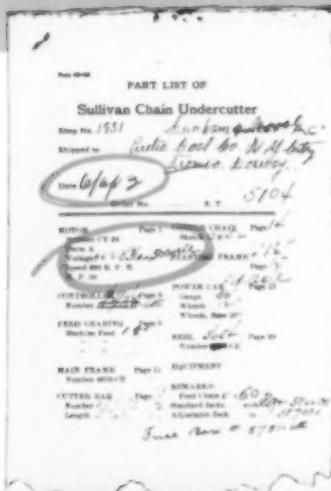


Loading out iron ore in Sweden.

# JOY AC EQUIPMENT...USED WORLD



A 440V AC loader in salt; Hockley, Texas.

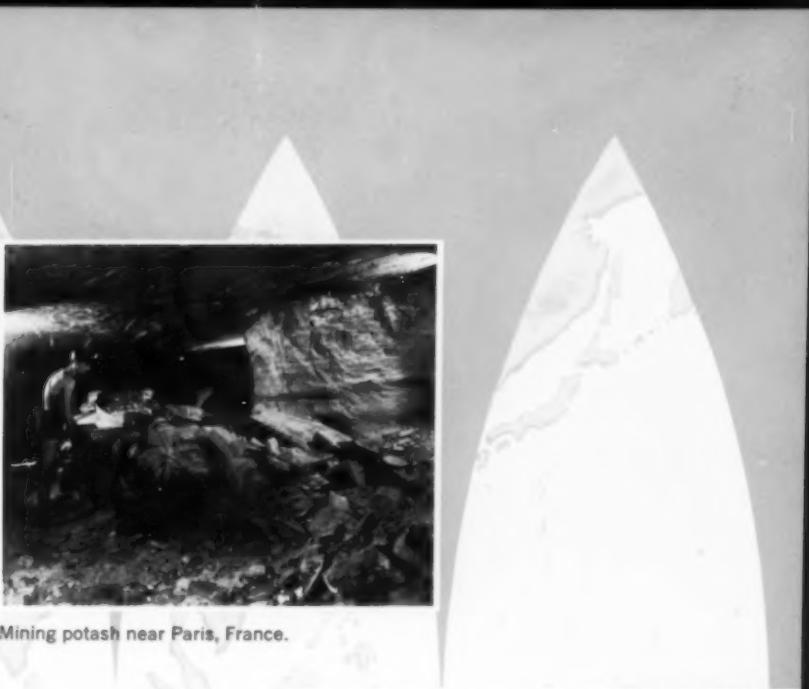


These are just a few of the places where Joy AC face equipment has been at work for years, and just a few of the minerals in which it is working. A Joy AC team of cutter, continuous miner, extensible belt and elevating conveyor has even been used to excavate permafrost under the wastes of Greenland. Other Joy AC firsts include:

- 1913—Shortwall cutter
- 1924—5-BU loader
- 1930—Coal drill
- 1933—8-BU loader
- 1935—11-BU loader
- 1940—14-BU loader
- 1946—10-RU cutter
- 1950—4-JCM miner
- 1950—3-JCM miner
- 1953—1-CM miner
- 1955—60-E shuttle car
- 1956—10-SC shuttle car
- 1958—16-SC shuttle car



A modern mine in Lorraine, France.



Mining potash near Paris, France.

# -WIDE SINCE 1913



Tunnel driving with a hard rock loader in Venezuela.



A 3-JCM in the state of Washington.



Joy 15-RU cutting potash in New Mexico.

An 11-BU AC loader in bauxite mine.



## What does this mean to you as a mine operator?

Joy's vast experience in the design and development of AC face equipment means that we have already encountered and solved most problems common to AC mechanized mining. This experience is valuable because it is doubly important to properly specify and design AC equipment in order to achieve satisfactory operation and realize savings.



## and back to the U.S.A...

Here, a modern Joy 10SC-AC shuttle car is handling 10 tons of coal in an all-AC equipped mine.

### JOY AC SHUTTLE CARS—NEWEST MEMBER OF THE JOY AC TEAM

**Developed in 1955**, thirty Joy AC shuttle cars are now in operation in eastern and western Pennsylvania, West Virginia, Utah, Colorado and Australia.

Until recently, AC motors on shuttle cars presented torque and horsepower problems. In designing the AC Shuttle Car, Joy engineers developed an AC electrical system that provides the required traction, torque and speed characteristics for Joy's already mechanically per-

fected and proven car. Included are motors that function efficiently even when voltage fluctuations are as great as  $\pm 10\%$ .

**Double Torque Direct Drive**—The Joy AC electrical system makes available 10 times normal torque for starting, pulling heavy grades or auxiliary braking through the proved Joy direct drive . . . no torque converters, differentials, clutches or power-wasting transmissions. This double torque direct drive can be controlled automatically or manually to provide efficient two-speed control.

**Low Cost Operation**—Joy AC shuttle cars, are mechanically simple, rugged, and foolproof. Their electrical design is the result of the Joy concept of job engineering for the greatest efficiency at the lowest over-all cost. Joy AC shuttle cars will simplify new mine installations and modernize those already established. Talk to a Joy engineer about AC cars . . . and about a complete Joy AC mining team. It's available NOW! **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada, **Joy Manufacturing Company (Canada) Limited, Galt, Ontario.**



**Write for bulletins  
and technical information  
on AC equipment**

**Ask for 237**



# JOY

*Consult a Joy Engineer*



## Brussels Fair Model

Giant miniature shows an entire industry from coal mines to rolling mills.

The European Coal & Steel Community has the largest model ever built on exhibition in its pavilion at the Brussels World Fair. A German company, Demag, of Duisburg, built the model of an entire basic industry at a scale of 1:30. It is accurate down to the tiniest detail—from coal and ore mines, transhipment facilities, coke ovens, by-product plants, power stations and sintering plant to blast furnaces, steel works and rolling mills. The model is 200 ft long, covers an area of 7,750 sq ft and some parts of it such as the blast furnace plant are almost human height.

**Actual Plant**—The designers based the unique model on an integrated steel plant with an annual output production of 2 million tons of ingot steel. All installations and equipment shown have actually been built, either for the industries of the European Coal & Steel Community countries (Germany, France, Italy, Belgium, Holland and Luxembourg), or for overseas. Open customs barriers through which the trains loaded with coal, ore, steel and rolled products speed on their way around the model, symbolize the idea of the European union.

**Picture**—The photo shows part of the model—harbor facilities, two blast furnaces, sintering plant—while being assembled. Demag Co. had the help of specialist firms and built the whole model in only six months. Visitors can operate the installations of the model by pressing buttons or turning handles.

## INDIA

### U.S. Technical Aid

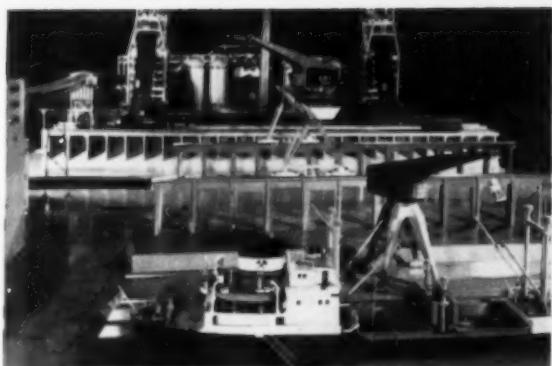
A group of United States engineers is helping to mechanize a vast lignite mining project at Neyveli, India. They are trying to tap a 200-million ton lignite deposit there to stimulate industrial expansion in southern India.

The workmen will make a cut 180 ft deep, 1,200 ft wide and 6,000 ft long in order to remove overburden of sandstone, gravel, sand and clay. This should expose the first sections of lignite.

The Goodyear Tire & Rubber Co.'s Wolverhampton, England, plant has made 13 mi of 48-in conveyor belting to be used in the stripping operation. The mine is scheduled to produce at an annual rate of 3,500,000 tons.

## OVERSEAS FLASHES

**RED CHINA**—This nation claims to have produced 27,980,000 tons of coal in the first three months of this year, 10.9% more than their target, they say. The



## BELT FAILURES? Switch to NEW YORK RUBBER!

New York Rubber, famous since 1851, manufactures belt designed to meet trouble—and overcome it! Built for the most severe service demands, there's a New York Rubber belt designed to solve *your* problem. Mineral mining, quarrying, coal mining—these activities often require a belt that will show superior resistance to sharp and abrasive materials, frequently in the presence of oil and grease conditions. Fire, too, takes its toll of conventional belts.

That's why it will pay you to investigate New York Rubber. A brief description of four of our most popular belts follows. Write on your letterhead for more complete details on these and other superior New York Rubber Belts.



## REDUCE FAILURES

with these New York Rubber belts:

**STONORE**—Highest quality, for most severe service. Handles heavy ores, trap rock, crushed stone, coarse broken glass, slag, cement clinkers, direct feed from digging and mining machinery. Mildew-proof.

**DEPENDABLE**—For handling coal both under and above ground, sand and gravel, trap rock, sulphur, lime and limestone. Ideal for sub-zero temperatures. Mildew-proof.

**NEOPRENE**—Resists oil and grease conditions adverse to natural rubber. Handles caustics and coal briquettes. Heat-resistant to 250°F. Mildew-proof.

**TEMP-PRENE\***—A neoprene compounded for fire resistance and severe, rough surfaces. Mildew-proof.

\*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-11".



**NEW YORK RUBBER**

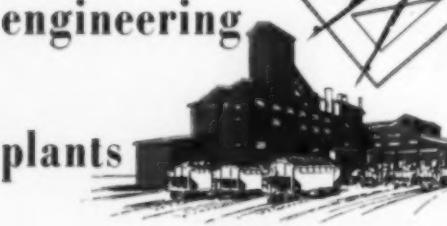
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# FAIRMONT—Helpful Partner to the Coal Industry!

This is the service mark **FAIRMONT** that has been a beacon to the coal industry for over sixty years. Fairmont whose engineering skill has led to coal cleaning plants of better than 99% separating efficiency and which helps the operator get the upgraded product to market and delivered at top dollar value. Call  or write  us today.



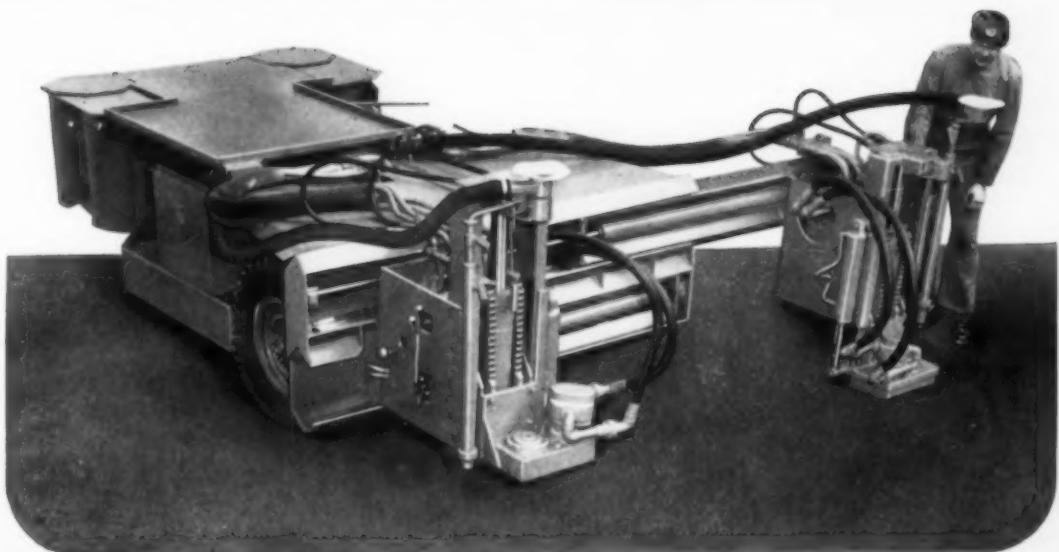
## FAIRMONT MACHINERY COMPANY

FAIRMONT, WEST VIRGINIA

DESIGNERS AND CONSTRUCTORS OF COMPLETE COAL PREPARATION PLANTS USING BOTH WET AND DRY CLEANING, CENTRIFUGAL AND THERMAL DRYING.

# FLETCHER DUAL DRILLS

## with Automatic Feed Control



LATCH DOWN the feed and rotation levers on this Fletcher Model DJ drill — turn your back on it — and it will drill a full-depth hole through roof that varies from soft shale to hard sandstone faster and more efficiently than the best-trained drill operator. Speed drops and thrust increases when it hits sandstone — instantly — before the bit can be dulled — and thrust drops while rotation and penetration rate increase as softer material is entered.

### The Results? →

- More bolts installed per shift!
- More footage per bit — so lower bit cost!
- Every operator gets top results because no experience or "feel" is required!

**Fletcher**  
ROOF CONTROL DRILLS

Check with your Fletcher field man on the Model DJ — or any of the many other Fletcher designs. You'll quickly discover why more Fletcher Drills are in service than all other rotary drills combined!

**J. H. FLETCHER & CO.**

P. O. Box 2143, HUNTINGTON 18, WEST VIRGINIA  
Jackson 5-7811

## Coal Abroad (Continued)

average daily output for the period was 35% higher than the same period in 1957. The communist radio also reports that hydraulic mining in the Kailan and Pinghsing coalfields has cut the cost of coal mining to half the conventional method per ton. Thirty other mines will get hydraulic mining this year, it is added.

**ITALY**—This country will get 1,055,000 tons of Russian anthracite over the next four years, according to recent Italo-Russian trade agreements. Russia will ship Italy 230,000 tons this year, 250,000 tons next year, 275,000 tons in 1960 and 300,000 tons in 1961. The anthracite is priced at \$3.20 to \$4.00 a ton.

**BULGARIA**—The Mariza coal fields in Bulgaria will yield a total of 10½ million tons of brown coal which is roughly equal to the total yield in all Bulgarian coalfields in 1956. New equipment is going into action fast in hopes of mining a total of 500 million tons of lignite within the next half-century.

**ARGENTINA**—Argentine coal purchases which have been oscillating between the United States and Poland the last three years are expected to go back to Polish suppliers once more this year. Argentina

would prefer American coal because its entire railroad system is geared to that type of fuel, but coal shipments from the U. S. contributed considerably to Argentina's commercial trade deficit with the U. S., amounting to \$152 million in 1957, necessitating a switch.

**JAPAN**—This nation's purchases of American coal will most likely decline sharply during the coming months. Japan's foreign exchange budget for the first half of fiscal 1958 has allocated, from April, only \$38½ million for coal imports, and that is considerably lower than the \$63 million that was allotted for the same half in 1957.

**RUSSIA**—The USSR will buy French coal washing plants. A Soviet trade mission has been negotiating with Societe De Preparation Industrielle Des Combustibles for the purchase of three complete plants. This is the second Russian coal mission to go to France within the past two months.

**GREAT BRITAIN**—Scottish Oils, Ltd., a subsidiary of British Petroleum Ltd., is experimenting with a method of condensing gas from underground shale into crude oil at ground level. The shale is drilled horizontally and then ignited. Theory is that gas from the underground

fire will condense at ground level in crude oil.

**GERMANY**—Coal importers in this country predict a drop in U. S. coal imports by roughly 3 million tons or 20% to 12.9 million tons this year. The Economics Ministry believes in an even bigger drop. During the first three months of this year, West Germany imported about 3.2 million tons of U. S. coal, 1 million tons less than they bought during the last quarter of 1957.

**YUGOSLAVIA**—During the coming year, the head of this nation, Tito, plans to spend roughly \$50,000 on research work in connection with the chemical refinement of home-produced coal. The country is experiencing improved mining facilities, better equipment and a larger coal yield due to the opening up of new seams, plus a steady increase in by-products from coking plants. Official circles add that foreign research institutes will be invited to cooperate.

**SOUTHERN RHODESIA**—One of the three pits of Wankie Colliery, the only colliery in the Federation of Rhodesia and Mayaland, is to cease production and be placed on a caretaker basis. The decision stems from the reduction in the demand for coal by the Northern Rhodesian copper-mining companies and the lack of export markets of Rhodesian coal.

**NOW... Bluefield Booth No. C-21**  
**WET ROCKDUSTING**

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2. Stainless Steel Hopper  
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- Side Dump Cars
- Bottom Dump Cars
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for your specific needs”*

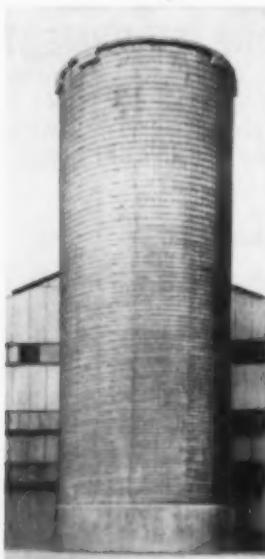


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**NEFF & FRY COMPANY**  
320 Elm St., Camden, Ohio



It's the STAVE  
that makes the difference

## Current Coal Patents

By: Oliver S. North

Apparatus for mine roof control, J. F. Joy (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Mar. 18, 1958. Construction of hydraulically-operated walking jack mechanism having rolling contact with the mine floor. Jack can be advanced without complete release of roof support, and has sufficient yield to accommodate at least minor local subsidence. No. 2,826,898.

Head swinging mechanism for a continuous miner, J. R. Sibley (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Mar. 18, 1958. Improved swinging mechanism for the disintegrating head of a continuous miner. Head can be adjusted around an upright pivot to different lateral positions. Mechanism is simple, compact and rugged. No. 2,826,923.

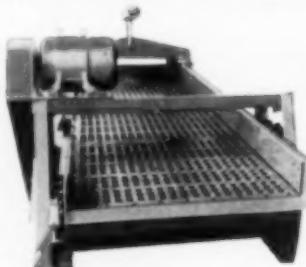
Continuous mining machine with roof contacting means, W. N. Poundstone (assigned to Pittsburgh Consolidation Coal Co., Pittsburgh, Pa.), Mar. 18, 1958. Use of attached roof-contacting members enables existing mining machines to de-

velop increased traction without adding ballast and without using larger grousers on the endless treads. Machine develops greater advance thrust, thus permitting installation of larger cutting head motors. Machine's capacity is increased, and wear and breakage of cutter bits reduced. No. 2,827,274.

Bit holder for trapezoidal type cutter bits and manufacture thereof, C. B. Krekeler and A. O. Bruestle (assigned to The Cincinnati Mine Machinery Co., Cincinnati, Ohio), Mar. 18, 1958. Low-cost cutter bit holder having an adequate flat stop, or abutment, for engaging a face of the bit and sustaining the main cutting thrusts. Clearance is provided for an unused bit point. No. 2,827,275.

Vibratory classification screen with means for dampening vibrations, J. W. Wantling, Mar. 25, 1958. Improved vibratory screen apparatus for classifying coal. Dual eccentric shafts are adjustable to bring the offset weights into various phase relationships for varying vibration intensity or amplitude according to the nature of the material being

## HENDRICK H QUALITY STEEL PLATE SCREENS COAL MORE ECONOMICALLY



Tough and rugged Hendrick H Quality Steel Perforated Plate lasts longer, even under continuous and heavy-duty use, because it is made from heat-treated high-carbon steel. It screens coal easier and faster, while the full clearance of its perforation reduces downtime costs due to blinding. Product uniformity is assured throughout the life of the screen. For all these reasons, Hendrick H Quality Steel

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CARBONDALE, PA.

May, 1958 • COAL AGE



## 1250-B BOOSTS YARDAGE FOR WEIRTON

**West Virginia Firm Adds Bucyrus-Erie Walker  
To Uncover Deep Coal Seams**

To reach deeper coal seams, a Bucyrus-Erie 1250-B walking dragline has gone to work in Pennweir Construction Company's open pit mine. Pennweir Construction Company is a subsidiary of Weirton Construction Company. The mining property, covering some 6,000 acres, is on the West Virginia-Pennsylvania border about 25 miles southwest of Pittsburgh.

The 1250-B handles a 33-yd. bucket on a 200-ft. boom to uncover seams of bituminous Pittsburgh Eight running 58 inches thick.

This machine — christened the *Angelie* — brings a substantial yardage increase to the Weirton operation. In addition to moving overburden high and wide, it moves it economically — a tradition of Bucyrus-Erie walking draglines.

Modern front end design combining great strength with light weight permits Bucyrus-Erie walkers to swing big buckets on long booms . . . contributes to outstanding performance. Ward Leonard variable voltage control gives you extra fast acceleration and deceleration for speedy cycles. Exclusive Bucyrus-Erie walking mechanism permits smooth, fast moveups, easy maneuvering to best working position. These features plus month-after-month dependability and low maintenance are your assurance of high production.

To move big yardages economically, choose from the world's largest selection of walking draglines. Contact us for details today. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

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# PERFORMANCE-PROVED FOR 50 YEARS



## American Rolling Ring Coal Crusher

In 1908 American Pulverizer patented the rolling ring principle of coal reduction. Today there are thousands of American Coal Crushers in operation ranging in size from Sample Crushers to Crushers having a capacity of 800 tons per hour.

American manufactures reduction equipment exclusively, backed by a half century of experience in the production of coal reduction equipment. Although improvements have been consistently made in American Crushers, the rolling ring principle still remains the most efficient method of coal reduction. This fact is **performance-proved** by hundreds of "cost of operations" reports from customers of American Rolling Ring Coal Crushers. May we have our engineers analyze your reduction problem?

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**PULVERIZER COMPANY**  
OF RING CRUSHERS AND PULVERIZERS  
SAINT LOUIS 10, MO.

## Patents (Continued)

handled or the results desired. No. 2,828,014.

Jig separator, G. A. Vissac, Mar. 25, 1958. Jig separator for cleaning, concentrating or classifying fine coal or minerals by means of pulsations of a fluid medium, such as water or air. Pulsations are automatically stopped when thickness or density of the bed drops below a predetermined point and started again when bed is restored to its proper thickness or density. No. 2,828,015.

Dust collector, A. R. Hood and J. W. Miller, Mar. 25, 1958. Dust collector for use with drills that form up holes for roof bolting purposes. Collector is sup-bolted by the drill itself, to which it is easily attached. The collector can accommodate drill steels of different diameters. No. 2,828,108.

Cutter bits having reinforcing ribs, A. O. Bruestle and C. B. Krekeler (assigned to The Cincinnati Mine Machinery Co., Cincinnati, Ohio), Mar. 25, 1958. Method of making mining machine cutter bits having very substantially lengthened service life at a negligible increase in cost. The depth of the metal lying immediately behind the cutting edge is increased by providing a rib on the bar stock. Spalling and breakage are minimized and wear resistance is greatly improved. No. 2,828,117.

Articulating conveyor system and unit therefor, H. J. Thomas, Apr. 1, 1958. Unique method and means for inter-connecting coal conveyor troughs, all of which are powered by the same power source and all pivotally connected by means which control centering of both the conveyor flights and the drag chain. Coal can be conveyed around obstructions or corners without spillage thereof at pivot points and without loss of power efficiency. No. 2,828,851.

Mine roof bolt installation, J. B. Dempsey, Apr. 8, 1958. Mine roof bolt assembly and method of installation whereby the bolt will remain permanently anchored in place even though the roof strata is of the type that tends to spall or crumble on exposure to air. A package of cement grout is first inserted into the hole and opened. Bolt is then inserted and the anchoring means expanded into the grout before latter hardens. No. 2,829,502.

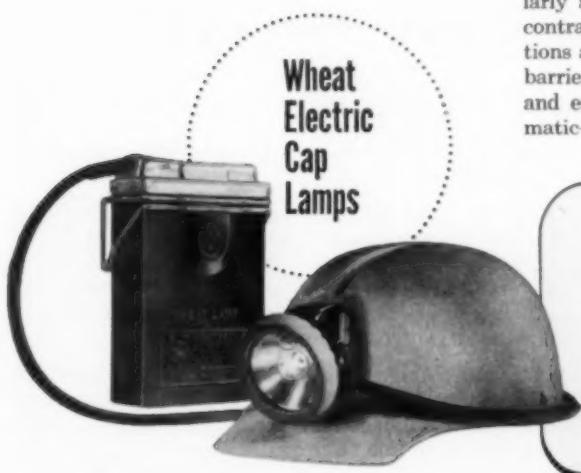
Cuttings discharge device, R. A. McCallum (assigned to Goodman Mfg. Co., Chicago, Ill.), Apr. 8, 1958. Design for an improved cuttings discharge device for a kerf cutting machine. Power consumption requirements for the screw conveyor can be cut drastically by ex-



THE TREND  
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## More Wheat Lamps in More Modern Mines ...month after month, every year!

Self-evident value sells WHEAT. Wheat plainly provides *more light* per contract dollar. Wheat sales advance in the largest operations and in the smaller progressive mines—size presents no barrier to the Wheat combination of high-standard lighting and exceptionally low-cost maintenance. Charging is automatic—for one or any number of lamps. *Let us detail the facts.*



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Dump body mounted on Dodge 900 chassis with Custom cab.

## Dodge Heavy-Duty Finance Plan is designed to save you money!

Need a new truck, but need to watch your working capital, too? The Dodge retail finance plan for heavy-duty trucks was designed for just that situation. It lets you operate modern, efficient trucks without burdening yourself with excessive finance charges.

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plan? Any Dodge medium-duty, heavy-duty (400 through 900 models) or four-wheel-drive trucks, plus extra equipment, including bodies mounted on the trucks.

This new plan makes it both easy and economical for you to get *Power-Giant* advantages: exclusive Power-Dome V-8 engines that keep maintenance at a minimum . . . rugged "Job-Rated" construction . . . famous Dodge economy and dependability . . . advanced Dodge styling.

Let your Dodge truck dealer show you how this Heavy-Duty Retail Finance Plan helps truck operators with established credit own thrifty new Dodge *Power Giants*. See your dealer soon.

**DODGE *Power Giants***

# Right off the *Wire*

An automatic ultrasonic welder makes tack welds without heat at the rate of 200 inches per minute.



Miniature mercury lamps are being used in batteries of twelve for night aerial photography. An area of sixteen square miles can be lighted from an altitude of 20,000 feet.



A new electron microscope permits the examination of opaque specimens.



An electronic converter makes any radio an appliance timer.



A three-year test of a 43,000-pound ship's propeller made of nialite (nickel-cadmium bronze) shows no wear caused by erosion or cavitation.



D. W. Kitchin and O. S. Pratt of Simplex recently made two major discoveries in studying corona spaces in cables — one, by observing internal pressure decrease, and another by mapping with silver cyanide solution.



A distillation column sixteen feet high and made entirely of glass is said to be the world's largest. It will be used to make silicon carbide with impurities of only one part in ten billion.



It has been demonstrated for the first time that petroleum is a colloidal dispersion. This knowledge may help in obtaining greater recovery from existing oil reserves.



A giant machine to hold large assemblies for welding can lift, tilt and rotate weights up to forty tons.



A tiny photoflash bulb is said to give the same amount of light as one four times its size. It uses zirconium rolled to foil gauge.

Over 1300 industrial concerns in this country are now using radioactive byproducts. About 200 were added to this list during the last year.



Air power for generators in remote installations, such as aids to air or marine navigation, can be supplied by a modern windmill which has a thirty-foot, three-bladed "propeller." It maintains constant speed.



Temperatures as high as 3500°F. are resisted by a new molded plastic.



Polyethylene is now made with an ultraviolet inhibitor and is said to last four times longer than the unprotected form.



**Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.**



Nuclear reactors may be used as economical sources of heat to convert coal into gaseous or liquid fuels.



A stereo cartridge to play the 45-45 Westrex groove records is in production.



South Carolina is putting its automobile drivers' licenses on photosensitive, anodized aluminum. They will be used for four years.



Speeds of 15,000 miles per hour and temperatures as high as 18,000°F. can be reached momentarily in a new wind tunnel being built to test missile nose cones.



"Silicone Insulation as Applied to Wire and Cable" is the title of a research paper by P. H. Ware of Simplex. This insulation is trade named "Thermoplex".

Flexible tanks of rubberized fabric are being made for use in the oil fields. They hold 15,000 gallons, but can be rolled into a package eight feet by two and one half feet when empty.



Kraft paper, shrunk after forming, is being used for shopping bags and multi-walled sacks. It stretches under tension and is said to be twenty per cent stronger than papers now in use for this purpose.



A portable scale that needs no pit is made for roadside weighing. It can handle vehicles sixty feet long weighing seventy tons.



## Protection plus

C-L-X (sealex) is a continuous, lightweight, exterior metallic cable sheath recently introduced by Simplex. Impermeable to gases, chemicals and water, C-L-X is ideal for almost any installation including aerial applications, industrial distribution and direct burial, as shown above. Practically any type of cable core can be used for such applications as power, control, signal and communication installations.

Other features include extreme pliability, ease of handling, long life, easy installation and relocation, and color coding for voltage or circuit identification.

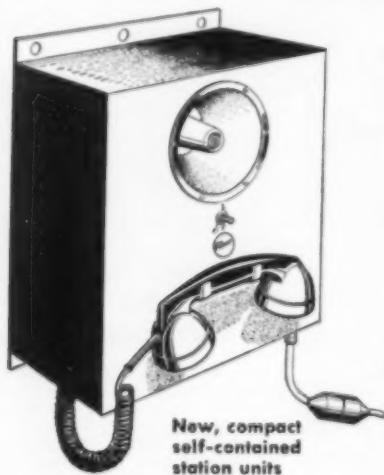
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Here is highly efficient underground communication at low cost. Any number of stations may be installed in one network for increased production, improved morale and safety.



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COMMUNICATION • Electronic Engineers • AUTOMATION

#### Patents (Continued)

tending the conveyor beyond its guide tube. No. 2,829,763.

Dust collecting head, R. E. Brochetti (assigned to Mine Safety Appliances Co., Pittsburgh, Pa.) Apr. 8, 1958. Improved suction dust collecting head for collecting dust from drilling operations, particularly the drilling of holes for mine roof bolts. Collector fits snugly around lower end of hole being drilled. Drill may be removed from hole without removing the collecting head. No. 2,829,867.

Flexible pusher plate for boring type mining machine, E. J. Hlinsky (assigned to Goodman Mfg. Co., Chicago, Ill.), Apr. 8, 1958. Design for an improved form of flexible pusher plate for deflecting cutting onto conveyor of a boring type mining machine. Plate is flexible enough to permit maneuvering of the machine. No. 2,829,875.

Cusp breaker means for boring type mining machine, J. C. Bailey (assigned to Goodman Mfg. Co., Chicago, Ill.), Apr. 8, 1958. Simple, rugged and effective device for automatically breaking the lower cusp, left by a boring mining machine, into pieces small enough to avoid jamming of the conveyor. A pair of breaker blades is installed just ahead of the conveyor throat, each blade being spaced to engage the cusp at a point where it is thinner, and therefore weaker, than at the center. No. 2,829,876.

Rock dust collecting apparatus, R. E. Brochetti and E. J. Hohos (assigned to Mine Safety Appliances Co., Pittsburgh, Pa.), Apr. 8, 1958. Dust collecting apparatus for mine roof drilling. Collecting head and suction hose can be quickly attached to and removed from their support. The head is flexibly supported by a heavy coil spring in such manner that it can adjust itself to any required position. No. 2,829,908.

#### Preparation Facilities

Pocahontas Fuel Co., Inc., Crane Creek mine, McComas, W. Va.—Contract closed with Fairmont Machine Co. for five Concenco No. 77 Diagonal-Deck coal washing tables.

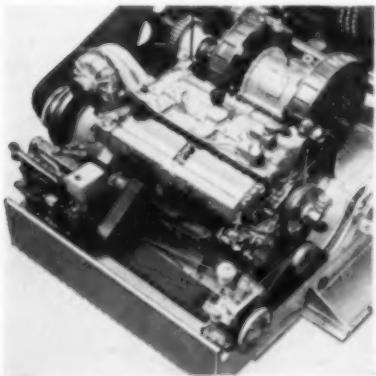
Pocahontas Fuel Co., Inc., Sagamore mine, McComas, W. Va.—Contract closed with Fairmont Machinery Co. for two Concenco No. 77 Model HCRD Diagonal-Deck coal washing tables.

Jamison Coal Co., Greensburg, Pa., Cochran mine, Salina, Pa.—Contract



#### SOLID STABILITY

Look at this massive carbody and these long, wide crawlers! A solid base and a low ground bearing pressure of only 9.6 lbs. per sq. inch let you work right at the edge of a bank.



#### UNIFIED POWER PACKAGE

The 4500 is diesel engine powered with the capacity to tackle any job. There are no fussy electric motors . . . no dead-weight . . . no delicate circuits.

## a quick guide to increased mining output with the Manitowoc 4500



#### GREATER MOBILITY

Your operator travels steep grades without "babying" his machine . . . there's no rocking when moving. Lets you mine anywhere! And fast between job moves can be made by rail or highway trailer.



#### DIRECT POWER FLOW

No one but Manitowoc gives you a slide pinion design that directs power straight to the "business end". Only gears that are working turn and there are only 15 gears in the entire unit!



#### HI-LIFT BOOM

A 60' Hi-Lift shovel boom and a 45' stick are available to give extra reach and height. Standard 120' dragline boom handles 6-yd. bucket . . . special 140' boom and 4-yd. bucket extends digging range.



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Simple, fast, reliable. Styles 77, 77-D, for standard uses with steel or spiral pipe, — Style 75 for light duty. Other styles for cast iron, plastic and other pipes. Sizes  $\frac{3}{4}$ " to 50".

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For plain or beveled end pipe Style 99. Simple, quick, and strong. Best engineered and most useful plain end coupling made — takes a real "bulldog" grip on the pipe. Sizes 2" to 12".

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Time saving, on-the-job grooving tools. Light weight, easy to handle — operate manually or from any power drive. Sizes  $\frac{3}{4}$ " to 8".

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P. O. BOX 509 • Elizabeth, N. J.

### Prep. Facilities (Continued)

closed with the Irvin-McKelvy Co. for cleaning plant equipment, including a heavy-media system, Deister tables, centrifugal driers and thermal driers. To treat four sizes of coal. Capacity 300 tph. Scheduled for completion late 1958.

**Tunnel Ridge Coal Co., Ashland, Pa.**—Contract closed with Deister Concentrator Co., Inc., for three SuperDuty Diagonal-Deck No. 7 coal washing tables to clean barley-size anthracite coal, and one table to clean No. 4 buck anthracite coal.

**Hellier Coal & Coke Co., Hellier, Ky.**—Contract closed with Deister Concentrator Co., Inc., for one Concenco No. 77 Diagonal-Deck coal washing table for cleaning  $\frac{3}{4}$ x0 coal.

**Mary Gail Coal Co., Mary Gail mine, Gail, Ky.**—Contract closed with Link-Belt Co. for one Multilouvre dryer to treat  $\frac{3}{4}$ x0 coal. Capacity 60 tph. Completion scheduled for May, 1958.

**Wisconsin Steel Div., International Harvester Co., No. 1 mine, Benham, Ky.**—Contract closed with Link-Belt Co. for a complete plant, baum jig wet tables and centrifugal driers for sizes ROM 5x0 coal. Capacity 400 tph. Scheduled completion, Jan., 1959.

**Island Creek Coal Co., Bradshaw, W. Va.**—Equipment supplied by Heyl & Patterson, Inc., which has closed contract with Eimco Corp. for an 8 ft-10 in

### Bituminous Output

YEAR TO DATE	PRODUCTION
April 12, 1958	111,784,000
April 13, 1957	145,117,000
1958 output 23.0% behind 1957.	
A month earlier output was 21.2% behind 1957.	

WEEK ENDING	PRODUCTION
April 12, 1958	6,200,000
April 13, 1957	6,960,000

### Anthracite Output

YEAR TO DATE	PRODUCTION
April 12, 1958	6,073,000
April 13, 1957	7,414,000
1958 output 18.1% behind 1957.	
A month earlier output was 17.3% behind 1957.	

WEEK ENDING	PRODUCTION
April 12, 1958	358,000
April 13, 1957	498,000



In carrier landings, planes coming in at more than 100 knots are stopped in a split second. This amazing performance is made possible by having each plane hook onto one of several wire ropes stretched across the flight deck. Both plane and rope receive an almost unbelievable shock at the moment of contact. Needless to say, only top-quality wire ropes can be used for this application because . .

## you can't bargain with safety

While your use of wire rope differs from this carrier application, *safety should be just as important to you*. For, although a "bargain" rope may save you money, it can cost you your peace of mind. So don't bargain with safety. Buy a rope that's a *quality* rope—buy Wickwire Rope.

5049



PRODUCT OF WICKWIRE SPENCER STEEL DIVISION  
THE COLORADO FUEL AND IRON CORPORATION

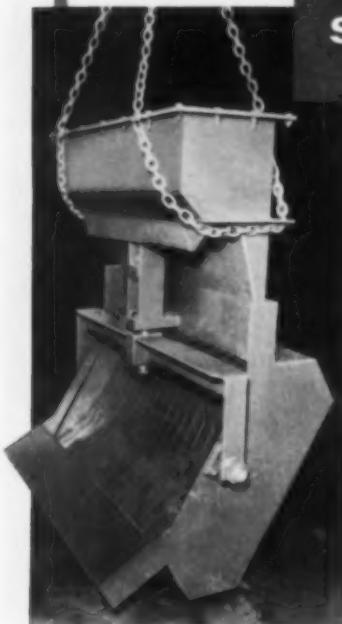
THE COLORADO FUEL AND IRON CORPORATION—Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tafo  
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane  
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LOOK FOR THE  
YELLOW TRIANGLE

## The Advantages of the

New

**H & P**  
**SIEVE BEND**



Here is a new classifier and dewaterer for the Coal Industry that outperforms conventional screening equipment. The H & P Sieve Bend is made in 1 ft. wide increments ranging from one to five feet. The performance of existing installations has been highly satisfactory and operating results have proven that the H & P Sieve Bend is

**SIMPLE  
EFFICIENT  
ECONOMICAL**

- **High capacity—300 GPM coal slurry per foot width of Sieve Bend with  $\frac{1}{2}$  mm slots.**
- **Low installation and operating costs—no connected horsepower.**
- **Minimum maintenance due to absence of moving parts.**
- **Complete elimination of noise and vibration.**
- **No bracing or heavy foundation required.**
- **Light weight, requiring minimum floor space.**
- **Efficient classification and effective dewatering of fine coal.**

For complete details write for bulletin 558 today or request the visit of a Heyl & Patterson Sales Engineer.

**Heyl & Patterson** INC

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### Prep. Facilities (Continued)

Diameter x 8 disc coal-type vacuum filter and auxiliaries, to handle 48x0 mesh clean coal. Capacity 11 tph.

**McNally Pittsburg Mfg. Corp.**—Contract closed with Eimco Corp. for 8 ft 10 in diameter x 8 disc Agidisc coal type filter and auxiliaries to be used in coal cleaning plant in Turkey. For cleaning fine coal.

**Wisconsin Steel Co. plant, Ky.**—Contract closed with Eimco Corp. by Link-Belt Co., which will supply equipment to Wisconsin Steel. Covers an 8 ft 10 in diameter x 10 disc coal-type vacuum filter and auxiliaries. Capacity 15 tph of 48x0 mesh clean coal.

**Clinchfield Coal Co., Compass No. 2 mine, Dola, W. Va.**—Contract closed with Fairmont Machinery Co. for conveyor screens and crushers as addition to present plant. Completion date, July, 1958.

**Pocahontas Fuel Co., Inc., Bishop mine, Bishop, Va.**—Contract closed with Fairmont Machinery Co. for five-cell No. 24 Denver Sub A flotation machine, 6-ft diameter x 6 disc Denver vacuum filter and filter-cake conveyor. For addition to present plant. Completion scheduled for May, 1958.

**Truax-Traer Coal Co., Ceredo plant, Ceredo, W. Va.**—Contract closed with Kanawha Mfg. Co. for an automatic sampling system for sampling clean coal from two loading-out points, using Galigh sampler and Syntron feeders.

**Clinchfield Coal Co., Moss No. 3 mine, Clinchfield, Va.**—Contract closed with Deister Concentrator Co., Inc., for ten Concenco No. 77 Diagonal-Deck coal washing tables for cleaning  $\frac{1}{4}$ x0 size coal and ten Concenco splitters.

## New Books

### Management

**Management in a Rapidly Changing Economy**, by Dan H. Fenn, Jr., states that with the ever increasing Soviet challenge facing us, American management must reevaluate and redouble its efforts to strengthen its system. The book discusses such problems as what social change means to management and what importance recent economic changes will be to modern business. The book offers opinions on how population and income changes will affect future management strategy and offers something for almost anyone concerned with the management field. 339 pp. 6x8½-in; cloth, \$5.00.

# LOOK—they're interconnectable!

O-B "cap screw"  
cable connectors

*you can connect this...*

- to any other single conductor cable
- either copper or aluminum
- from 4/0 to 1,590,000 CM
- same size or different size
- straight-thru, tap-off, or three-way
- simply by tightening two cap screws!

When you leave one of these O-B connector halves semi-permanently attached to the ends of your cable, you can make any of the above connections in a minute or two simply by tightening two cap screws. All connectors have ample strength, current-carrying capacity equal to or exceeding that of the cables themselves. Smooth, slim contours tape easily, drag over rough bottom without snagging. Ask your local O-B representative or write us today for more information.

**OHIO BRASS COMPANY • MANSFIELD, OHIO**  
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

*Ohio Brass*  




Straight-Thru Connector



Three-Way Plate



Tee Connector

have your  
bolting crews  
seen it yet?

## hold that roof

"suggested installation  
procedures for  
safe roof bolting"

a 27-minute  
sound-color film  
produced by  
Ohio Brass Co.

available through  
local O-B  
representatives for  
showings on your  
own property

already viewed  
by over 10,000  
mining men!

see your O-B  
representative  
or write direct to  
Ohio Brass Co.

# helping to

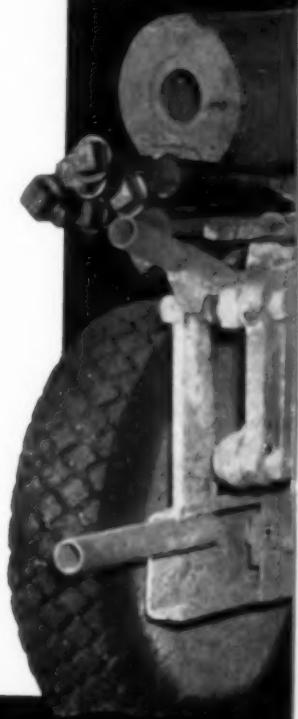
"Hold That Roof!" is the title of a 27-minute, sound-color film produced by Ohio Brass to promote a better understanding of bolting principles and practices among underground production workers and bolting crews. Using animated cartoons and on-the-spot photographs of bolting crews at work, the film describes in simple, easily understood terms current theories of roof support, correct installation procedures, drilling and wrenching techniques, hole size, installed tension, torque, and safety checks. Also shown are recommended safe procedures from the time the bolter enters the place to be bolted until the job is finished.

The film, which has already been shown to over 10,000 mining men, is available through local O-B representatives for scheduled showings at individual mine properties.

Why not ask your O-B representative for a "preview" showing to see how "Hold That Roof!" will fit into your bolting training program or safety campaign?



*This 20-page pocket-size "safety reminder" booklet covers the important points made by the film, is distributed to members of the audience after each showing.*



**“hold that roof!”**



# SHHH! he's listening to a cable fault!

*with the O-B Fault Locator*

Because they're so hard to find, hidden cable faults often cause more lost production, more wasted man hours — more wasted cable, in fact — than the big faults that rupture insulation and actually destroy cable. That's why you'll find more and more mine properties today investing in O-B Cable Fault Locators, in many cases using as many as 10 Locators on a single property!

Powerful, compact (you can carry it in your pockets), rugged and virtually "tamper-proof," the O-B Locator pinpoints in a matter of minutes cable faults that would ordinarily take hours to find. The complete unit weighs only four pounds and consists of just four elements: battery and signal generator (being attached to cable end below), and headphones and slim transistor receiver. The latter, as shown above, are the only parts carried along the cable during testing! Takes only minutes to set up, tests cable up to 600 feet or longer, costs less than any cable you'll use it on! Write for complete information, or order Catalog No. 22567 to try it out for yourself.

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B

4826-M

# Now a proved DROP BOTTOM CAR SPOTTER that will give you Dependable Performance!



Here is the simple S-D "DBS" Hydraulic Car Spotter shown with Sanford-Day Power Unit.

**SANFORD-DAY**

KNOXVILLE, TENNESSEE

After several years of development and testing, Sanford-Day engineers have found the successful design in a drop bottom car SPOTTER that offers you dependable performance for far greater efficiency where fast-rate loading is desired at loading points. This new, but proved, spotter is the S-D "DBS" Hydraulic Car Spotter. It completes our line of S-D Spotters and S-D "Brownie" Hoists for every requirement, including S-D Hydraulic Car Spotters for Rotary Dump Cars and cars of all designs. You are going to like these S-D Spotters for their consistent effectiveness and dependability! Write us today noting your particular requirement and let us help you fit the correct SPOTTER or HOIST to your needs. Sanford-Day Iron Works, Inc., P. O. Box 1511, Knoxville, Tenn., USA.

## S-D "Brownie" Hoist-and-Retriever Combination



Where loading conditions do not require a hydraulic car spotter, the S-D "Brownie" HKD Hoist-and-Retriever Combination is the efficient method of moving cars by loading points.

S-D "DBS" SPOTTER effectively moves trips without damaging doors because pushing dogs operate outside door compartments!



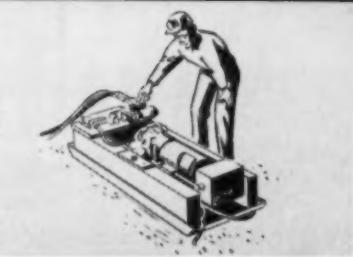
S-D "DBS" SPOTTER is the most portable spotter available. Track unit is in two sections, each 1200 lbs. and only 18 feet long.



S-D "DBS" SPOTTER offers you ONE STANDARD SPOTTER for cars from less than 10 feet in length to over 30 feet!



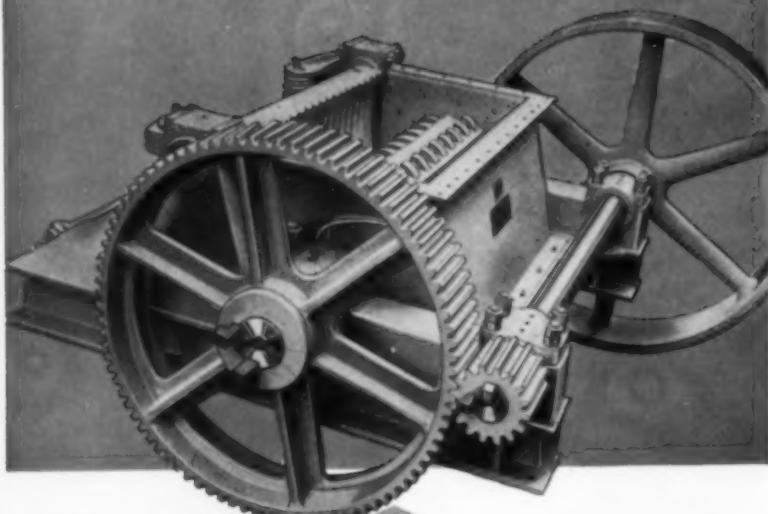
S-D "DBS" SPOTTER Power Unit is specially designed with hydraulic controls located on the power unit itself in one panel for convenient and easy servicing! No hydraulic control valves are located on track unit!



IMPROVED DESIGN

for crushing

COAL...SLATE...WASHERY  
REJECTS...MINE REFUSE



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**McLANAHAN**  
1835

*Super*  
**BLACK DIAMOND**  
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- Steelstrut Toggle automatically protects against uncrushable materials
- Quick adjustment for product size
- Cut steel gears

Now available at moderate cost are many of the famous Rockmaster Crusher features. This is a rugged, all-steel crusher—heavier than the conventional Black Diamond, yet not so heavy or costly as the Rockmaster. Super Black Diamond has split bronze bearings, easily-removable crushing plate and steel segment rolls. Write for Details.

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#### New Books (Continued)

McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y.

#### Welding

Safety in Welding and Cutting is a complete revision of the AWS-ASA 249 standard turned out by the American Welding Society, and dwells on a wide range of welding applications. Besides discussing the scope of welding applications, it gives valuable information on installation and operation of gas-welding and cutting equipment. The booklet takes a practical approach on fire prevention and protection as well as on health and ventilation in welding. 49 pp. 6x9-in; paper, \$2.00, American Welding Society, 33 W. 39th St., New York 18, N. Y.

#### Oil and Gas Supplies

The Future Supply of Oil and Gas, by B. C. Netschert. This work is a study of the availability of crude oil, natural gas and natural-gas liquids in the U. S. in the period through 1975. The author concludes that 500 billion barrels of oil and 1.2 quadrillion cu ft of natural gas exist in the U. S. and adjacent continental shelf. The author sets up a new framework of concepts and definitions in making the forecasts. 134 pp. 6x8½-in; cloth, \$3, The Johns Hopkins Press, Homewood, Baltimore 18, Md.

#### Safety

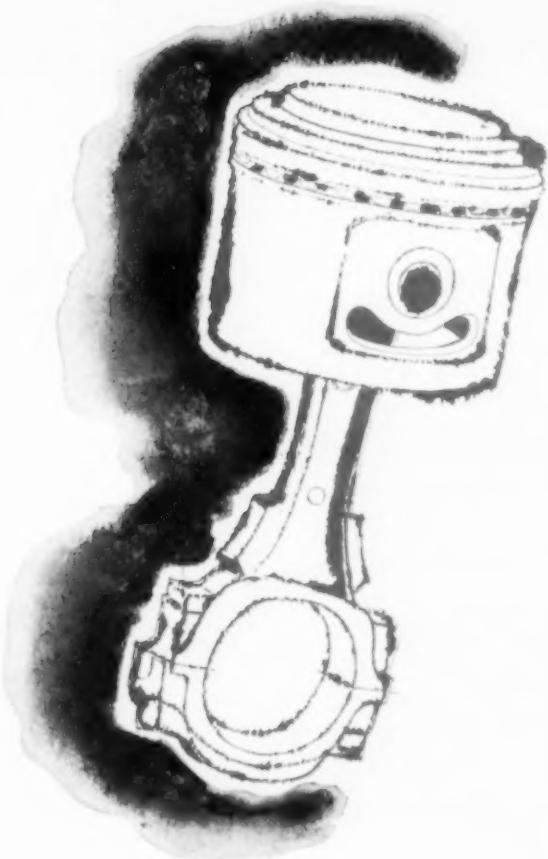
Rules for Safety and Book 8 in a series of Five Minute Safety Talks for Foremen are designed to promote safety in industry. Rules for Safety has 40 pages covering accident prevention do's and don'ts, how's and why's. The book of safety talks is a compilation of talks that appeared in earlier books in the series. Rules for Safety, 25¢; Safety Talks, \$1.95. National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

#### News Roundup (Continued)

companies, the United Mine Workers of America, the West Virginia Dept. of Mines and the U. S. Bureau of Mines to provide industry in the area with more well-trained first aid men.

Last July the league had 33 teams in competition. It turned out to be the largest first aid contest in the nation during 1957 except for the National Meet in Louisville, Ky. Coal operators and the United Mine Workers were represented by officials from Washington, D. C. and the U. S. Bureau of Mines from Pittsburgh. Winners of the meet were teams from Harewood, Montcoal, Minden and Levisay.

On the way home from the meet the Prenter team of American Coal & Dock

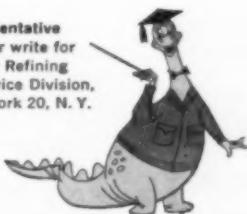


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## News Roundup (Continued)

chanced upon a serious accident and put their skill to actual use, dressing the injured and helping them to hospitals. This served to show that trained men scattered over several counties would be valuable in case of local disaster or emergency as well as in the coal mine.

## Mines, Companies

Pittsburgh Consolidation Coal Co. has a new name . . . Consolidation Coal Co.

Company directors felt that the old name was cumbersome and wordy without appropriately describing the firm's activities. Stockholders of the company have also approved an amended employee's retirement plan and amendments to the company's stock option plan. In addition, fourteen directors nominated were re-elected for the coming year.

Peabody Coal Co. has taken over the coal reserves of the Windsor Coal Co., an affiliate of the McAlester Fuel Co.

It is reported that Peabody will open a new modern mine near Calhoun, Mo.

The McAlester Fuel Co., that has distributed coal in the northern territory for 55 yr, has closed its Kansas City and Omaha sales offices and assigned its un-filled contracts and orders to the Peabody-Southern Coal Co.

Operators of small coal mines have protested against a bill that would require them to comply with the Federal Coal Mine Safety Act.

John L. Lewis, president of the UMW, has urged enactment of the bill in a recent testimony before a Senate labor sub-committee, saying he thought 90% of the coal producers in terms of tonnage supported the measure. Opponents of the bill say that the state can handle the safety problem adequately and that "small mines are far safer than the large mines" regulated by the U. S. Bureau of Mines.

Charles D. Richards, Middlesboro, Ky., has organized the National Association of Independent Coal Operators, a group that has particular appeal to truck coal mine operators.

The purpose of the organization is to promote the welfare, efficiency and general good of independent coal-mining industry in the United States.

The multi-million dollar coal washing plant built at Wellington, Utah, by the Columbia-Geneva Div., U. S. Steel Corp., has gone into full operation.

The property covers a 1,500-acre tract in Carbon County. While all phases of the construction job have not been completed, including the dump shack and finishing touches to parts of the plant that is operating, about half of the men working for the general contractor on the job are still employed.

## Utilization

More than 40 architects, school directors, smoke control officers, municipal authorities, consulting engineers and property management realtors attended a special meeting in Holyoke, Mass., sponsored by the Anthracite Information Bureau.

The meeting was designed to familiarize these people with new anthracite heating equipment and to discuss modernization of existing heating plants. Norman C. Curtin, assistant director of the AIB, spoke in the morning and the industry film, "For Property Management — The New Look in Modern Heating," was shown in the afternoon.

Recently, the AIB turned out a colorful new pamphlet describing the merits of the "Coal-Pak," the exciting new automatic heating unit for large buildings and institutions. The Institute has got its program of education on coal



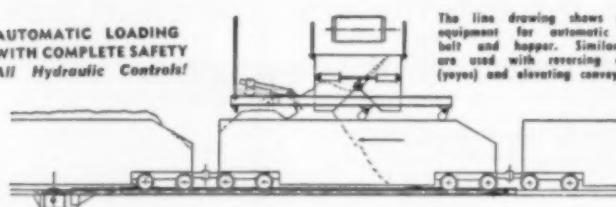
### The only COMPLETE line of car-spotting and car-loading equipment available

Two NOLAN Porta-Feeder models will help you meet every requirement and condition in spotting cars for loading: 1. Direct Mechanical Drive, 2. Hydraulic Cylinder Type, Hose Coupled to Remote Power Unit (shown above).

There are hundreds of NOLAN Feeders in operation. There are some in your vicinity—ask us to show you how efficient NOLAN equipment can be in your operation.

#### AUTOMATIC LOADING WITH COMPLETE SAFETY All Hydraulic Controls!

The line drawing shows arrangement of equipment for automatic loading from belt and hopper. Similar arrangements are used with reversing chain conveyor (yoker) and elevating conveyors.



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- Huntington Supply & Equipment Co., Huntington Nat'l Bank Bldg., Huntington, W. Va.
- John Lloyd & Sons, 33 Bennett Bldg., Wilkes-Barre, Pa.
- E. C. Harpe Machinery Co., 1726 Champa Street, Denver 2, Colorado
- Frank C. Hammott, P.O. Box 154, Castle Gate, Utah
- Amos A. Culp, 459 South 24th Street, Birmingham 5, Alabama
- John North Associates, P.O. Box 105, Harbor, Mich. (Chicago District)



### THE NOLAN COMPANY

106 Pennsylvania Street

Bowerston, Ohio



**"A drop in the bucket!"** The constructions shown here by Tom Weichel, Okonite's chief mining engineer, are just a random sampling of the cables that Okonite has developed for mining operations. More

than likely, Okonite has available right now the exact cable you need—in terms of toughness, flexibility, capacity, resistance to oils, acids, alkalies, mine water and high heat. If not . . . we know how to build it!

## Here's how we add value to your cable dollar

Behind these cable constructions are service records that prove the extra long life of Okocord portable cables in the face of continual high-speed reeling, rock falls, run-overs and constant dragging over mine floors and around sharp corners.

Longer cable life means lower operating costs . . . reduction of costly work stoppages . . . greater utilization of expensive equipment. Truly, Okocord represents money in the pocket for any mine operator.

*Here's how Okonite assures maximum value for your cable dollar:*

1. By the use of materials developed in 80 years of making the finest cables.
2. By constant research to find even better materials and constructions.
3. By intimate, first-hand knowledge of mining problems and conditions.
4. By self-imposed standards for manufacturing and testing that are more exacting than the industry requires.

There is an Okonite quality cable for your shovels, drills, shuttle cars, continuous miners and other equipment. There are Okonite specialists ready and willing to help you in the planning or installation stages. And there is a brand new booklet full of valuable hints on picking the right cable constructions for your all-important power or control circuits. Write for free Bulletin CA-1117—"How to choose insulated cable"—to The Okonite Co., Passaic, N. J.

Visit Booth G-49 at the Bluefield Coal Show and discuss your cable problems with Okonite's Tom Weichel.



where there's electrical power . . . there's **OKONITE CABLE**

## Utilization (Continued)

heating in full swing as is testified to by the new ultra-modern school now under construction in Attica, N. Y. (p 30). The school, heated by coal, has radiant panels, summer cooling and electronic controls as well as pneumatic coal and ash handling. The AIB reports that plans for a sixth-year anthracite industry public relations program have been approved by the anthracite industry council. The sixth consecutive year of the program started on May 1, marking a change in the start of the fiscal year

from August 1, in order to more nearly coincide with the coal year. Plans for the sixth year call for continued emphasis on public and press relations along with an educational program to reach architects, engineers and others who can be instrumental in the promotion of domestic and commercial space heating equipment.

**Mountaineer Carbon Co. is producing high-purity electrode carbon at its new plant in Cresap, W. Va.**

The carbon is of a suitable grade for anode use by the aluminum industry or

for graphitized electrodes as used by the electro-chemical and electro-metallurgical industries. The Standard Oil Co. and Consolidation Coal Co., formerly Pittsburgh Consolidation, jointly formed Mountaineer Carbon Co. in 1956. The site selected for the new plant was at Cresap, W. Va., where the raw material to be processed is presently green petroleum coke. At a later date, Consolidation Co. plans to produce a similar-type coke from the heavy residue portion of the liquids obtained from low-temperature carbonization of Ireland mine coal.

The bituminous coal industry has asked Congress to set up an independent research commission to help coal fill the nation's growing appetite for energy, it is reported.

Harry LaViers, president of South-East Coal Co., and a vice president of the National Coal Association, has stated that experts recently predicted the electric utility industry, already coal's top customer, will use three times as much coal in 1975. "A major factor in deciding coal's ability to meet the demands of our national welfare and security will lie in the extent to which the coal industry is kept currently sound," said Mr. LaViers.

On April 25 the anthracite section of Mining, Metallurgical and Petroleum Engineers discussed the problems of crushing the larger sizes of anthracite to get steam sizes of coal.

James Eckard, chief, Branch of Preparation and Utilization, U. S. Bureau of Mines Anthracite Experimental Station, was the key speaker at the meeting.

## Accidents

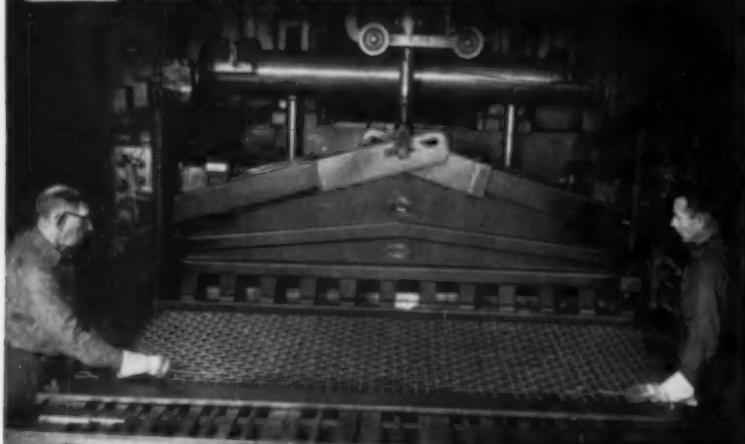
An "ignition" at Clinchfield Coal Corp.'s Moss No. 2 mine killed two men and injured four others in April.

Ralph Huffman, production manager, said the "ignition," which differs technically from a gas explosion, was caused when a pillar fell and forced gas from one section of the working face to another.

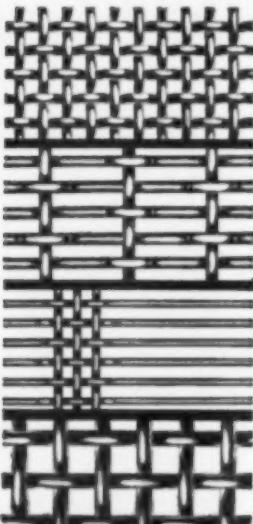
The Labor Department said recently that its drive to enforce safety standards in mines supplying coal to the Tennessee Valley Authority reduced coal mine deaths last year in three states.

It said its Wage-Hour and Public Contract divisions, using the threat of black-list to insure compliance, curbed mine fatalities in Kentucky, Tennessee and Virginia. These states, containing many mines which sell coal to TVA, reported a total of 18 fewer mining deaths in 1957 than in 1956 while the death total for the nation rose by 28 to 473, the department said.

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### LUDLOW-SAYLOR shears—does not burn—wire ends to insure accurate dimensions and to prevent distortion



Burning off uneven wire ends, after screens are woven, is common industry practice . . . but not Ludlow-Saylor! L-S Screens are trued up on a leveling machine, then are sharply sheared on all sides to insure absolute accuracy and to prevent any distortion of the precision-woven openings. This extra 2-man operation is typical of the many reasons why L-S Screens wear longer—stand up better under toughest conditions—and retain their rigid dimensional stability far longer than ordinary screens. *Order L-S Screens next time . . . you pay no more, but get much more!*

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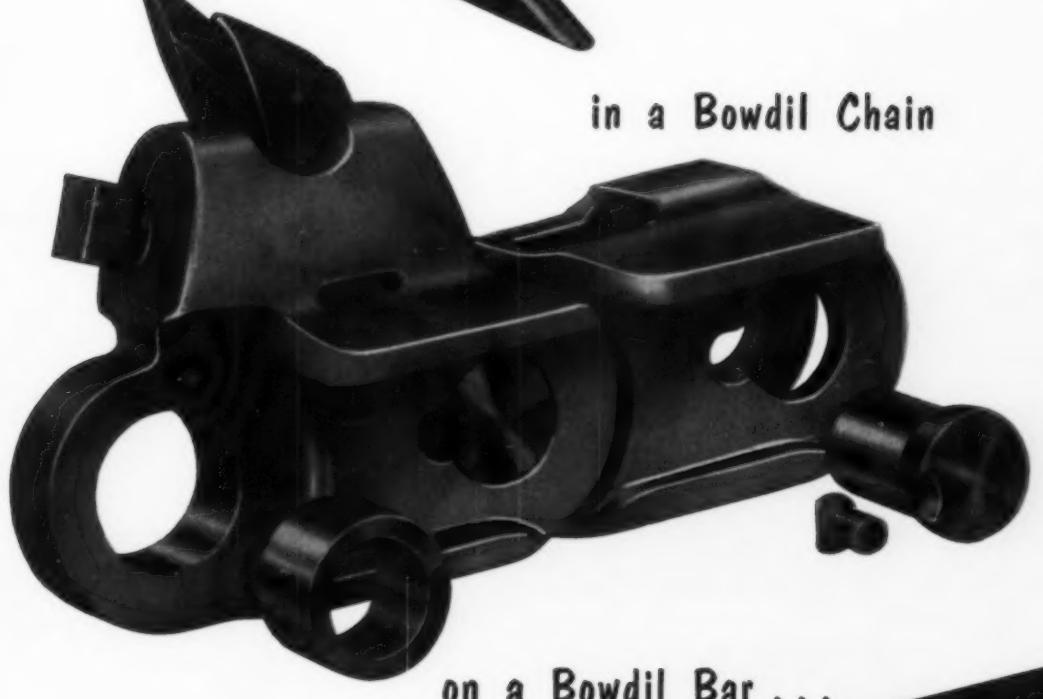


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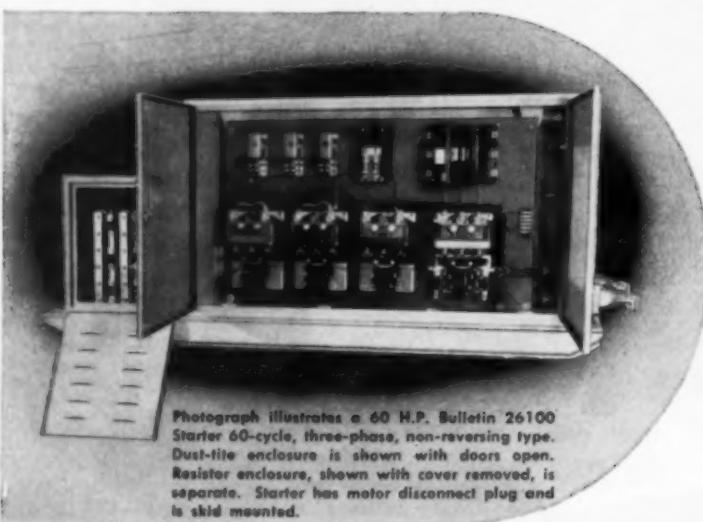


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A. C. Magnetic WOUND ROTOR

**MOTOR  
STARTERS**  
for...BELT CONVEYORS



Photograph illustrates a 60 H.P. Bulletin 26100 Starter 60-cycle, three-phase, non-reversing type. Dust-tite enclosure is shown with door open. Resistor enclosure, shown with cover removed, is separate. Starter has motor disconnect plug and is skid mounted.

**ENSIGN-CLARK**  
A. C. MAGNETIC STARTERS ARE ALSO  
AVAILABLE IN MANUAL REVERSING  
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Marietta concrete silos provide years of service with minimum maintenance . . . save money through reduced insurance costs.

Any type of mechanical or pneumatic conveyors, feeders or discharge systems can be safely mounted on top or on the side-walls of Marietta silos. Consult with Marietta now for the best answer to your particular storage problems . . . benefit by their more than 40 years "Know-how" in precast concrete and industrial storage systems.

Write now for a copy of the Marietta Industrial Storage Systems Booklet. Full cooperation extended to your own engineering staff, consultants and contractors.

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158 Abingdon Street, Galesburg, Illinois



## Equipment Approvals

Eleven approvals were issued during March.

Joy Mfg. Co.—Type 16SC1PH-XH-1 shuttle car; four motors, one 15 hp, one 10 hp, and two 20 hp, 440 V, AC. Approval 2-1337A, March 4.

Herold Mfg. Co.—Type SD-2 chain conveyor; two motors, each 50 hp, 250 V, DC. Approval 2-1338, March 4.

Joy Mfg. Co.—Type 5CM-2BH continuous miner, with wet roof drilling; five motors, one 30 hp, two 15 hp, and two 100 hp, 440 V, AC. Approval 2-1339A, March 5.

Joy Mfg. Co.—Type 5CM-2AE/F continuous miner; five motors, one 30 hp, two 10 hp, and two 100 hp, 250 or 500 V, DC. Approvals 2-1340/2-1340A, March 10.

Joy Mfg. Co.—Type 5CM-2BE/F continuous miner with wet roof drill; five motors, one 30 hp, two 10 hp, and two 100 hp, 250 or 500 V, DC. Approvals 2-1341/2-1341A, March 12.

Joy Mfg. Co.—Type 5CM-2AH-/2AHH continuous miner; five motors, one 30 hp, two 15 hp, two 100 hp, 415 V or 414 V, AC. Approval 2-1342A, March 12.

Jeffrey Mfg. Co.—Type MM86A Colmol with 948 conveyor; four motors, three 50 hp, and one 5 hp, 250/500 V, DC. Approvals 2-1343/2-1343A, March 18 and 19.

Jeffrey Mfg. Co.—Type MM86A Colmol without conveyor; three motors, each 50 hp, 250 V, DC. Approval 2-1344, March 21.

Joy Mfg. Co.—Type XB30R-5H belt conveyor; three motors, one 25 hp, and two 15 hp, 440 V, AC. Approval 2-1345A, March 26.

J. H. Fletcher Co.—Models DJC and DJD roof drills; one motor, 50 hp, 440 V, AC. Approval 2-1346A, March 31.

J. H. Fletcher Co.—Model DLC-14 roof control drill; one motor, 25 hp, 440 V, AC. Approval 2-1347A, March 31.

## Coming Next Month . . .

A full report of proceedings at the American Mining Congress Coal Convention at Cincinnati, May 5-7. This will be the first published review of the papers presented at the convention.



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**RESEARCH AND FOREMANSHIP**—C. M. Burk (left), retiring president, ICMI; E. T. Moroni, Bell & Zoller Coal Co., and S. M. Cassidy, Consolidation Coal Co.



**SAFETY**—C. A. Purcell, Indiana Bureau of Mines and Mining, Terre Haute.

Indiana Institute themes include foreman development and . . .

## Operations Research Outlook

APPLICATIONS of Operations Research to coal mining, the development of effective foremen, mobility in safety and a description of the explosion at Mine No. 31, Pocahontas Fuel Co. were subjects of speakers at the two technical sessions of the Indiana Coal Mining Institute at Vincennes, Ind., Apr. 12. Over 150 members and guests of the institute attended these sessions and the evening banquet. In an early-afternoon business session, members elected officers for the coming year, as follows:

President: Carl A. Donie, superintendent, Minnehaha mine, Fairview Collieries Corp., Linton, Ind., succeeding Colvin M. Burk, general superintendent, Viking Coal Corp., Terre Haute, Ind.

Vice presidents: E. M. Cassidy, superintendent, Talleymine, Snow Hill Coal Corp., Terre Haute; Ralph Whitman, superintendent, Ditzey Hill mine, Ingle Coal Corp., Elberfeld, and Michael Kensek, pillar-line supervisor, Enoco Collieries, Inc., Bruceville, Ind.

Ethel L. Morgan was reelected secretary-treasurer. Members of the new executive board are James Guiney, Highway Machine Co.; H. P. Roberts, C. F. Gharst Supply Co.; Charles Adams, Kenametal, Inc.; T. E. Davis, Jeffrey Mfg. Co.; Nathaniel Kirk, Snow Hill Coal Corp.; Placide Mayeur, Princeton Mining Co.; C. H. Hodgson, Mine Safety Appliances Co., and Ray Biggs, Viking Coal.

Mr. Burk presided at both sessions. Papers are as follows:

**Application of Operations Research to Coal Mining**, by Eugene T. Moroni,

general superintendent, West Kentucky Div., Bell & Zoller Coal Co., Madisonville, Ky.

Coal must assume the role of a vigorous growth industry, and it is with this in mind that Bituminous Coal Research has begun an investigation into the practical uses that Operations Research (OR) can lend to the industry. The goal of OR is to equip executives with all possible information relevant to a problem so that they can make decisions with a minimum of risk.

Three kinds of information are available to the executive when he is faced with making a decision. These are (1) precise numbers, (2) numbers less precise and subject to probability of error and (3) intuition alone, which is the outgrowth of judgment based upon past experience.

The tools of OR are largely mathematical—algebra, calculus, differential equations, theory of probability, symbolic logic and so on. These tools in the hands of an OR group enable them to seek in a large majority of cases a pattern of regularity in apparently unrelated or random activities. The pattern is expressed as a mathematical model. Changes in the model can be made on paper, which is less costly than tests.

Generally the men in OR hold advanced degrees in mathematics, physics, chemistry, logistics, industrial engineering and so on. There are several OR groups in the country serving many industries, and a number of larger companies have developed their own OR

teams. The cost more than justifies the savings. Several larger coal companies have started similar programs.

**Foremanship**, by S. M. Cassidy, vice president, Pittsburgh Consolidation Coal Co., Pittsburgh, Pa.

The foreman is a skilled officer leading a group of men. Foremen, as a group, are the lieutenants and captains of the industry. Usually, the prospective good foreman is a man who is not satisfied on the workman level. He aspires to move up by taking night-school courses in a program which will lead to his certification as a foreman



**EXPLOSION**—W. R. Park, district health and safety supervisor, USBM.

## Indiana Institute (Continued)

in the state in which he works. However, this certification indicates only that he has the minimum knowledge to assume a supervisory position. He must take a personal interest and must be assisted in his development thereafter.

In some areas the shortage of good foremen has become acute. It is, therefore, the responsibility of management to recognize men with the necessary qualifications, professional and personal, to make good foremen of these and then to keep them in the employ of the company. In most instances, recruit-

ing foremen from other companies is not the most satisfactory way to proceed. Better methods are to develop from within and to generate an interest in mining and a particular company among young men still in school.

Good human relations between top management and the foremen is essential, and fair treatment for foremen by management is vital. Rewards for high achievements in safety or production should be made. These may be financial or trips to conventions or any number of other ways of according recognition to the foreman who has done a good job.

The foreman must recognize his re-

sponsibilities. He must be willing to put forth that little extra effort that shows up as reduced section costs. He realizes the importance of recovering supplies and preventing waste, and he is willing to take care of his machines now at a cost of 10 tons to save 100 tons later.

**Mine Explosion at Mine No. 31, Pocahontas Fuel Co., Inc., McDowell County, W. Va.**, by W. R. Park, health and safety supervisor, District C, U. S. Bureau of Mines, Mt. Hope, W. Va.

It cannot definitely be said what caused the accumulation of gas or what was the source of ignition leading up to the Dec. 27, 1957, explosion which claimed the lives of 11 men. It was noted by investigators that rockdusting outby loading points was adequate, but hand-dispersed rock dust inby the loading points was insufficient.

The mine produces a high volume of methane in 24 hr, making it necessary to carry line curtains to within 8-10 ft of the face. Investigators surmise, after reviewing all available facts, that the accumulation may have resulted from damage to or opening of a check curtain in one of the headings to permit a shuttle car to travel for necessary supplies. A short circuit in the ventilating current resulted, and gas accumulated at the face of one of the headings in a multiple-entry section.

High praise was accorded a foreman and his 13-man crew in another section who executed previously-prepared plans for barricading themselves. They selected a position in entries which deadended against a fault and built inner and outer barricades. They carried their food and water into the space between the barricades, thus leaving the cell in back of the inner barricade as a place of further refuge. They left signs to direct rescue crews and remained inside the barricade until it was opened by the rescuers.

**Safety Is Mobile**, by Charles A. Purcell, director, Indiana Bureau of Mines and Mining, Terre Haute, Ind.

Activities in a mechanical section resemble a dog chasing his own tail. The object of the boss is to prevent him from ever catching it. Safety is part of this cycle, and should lead it. The first and highest hurdle already has been cleared, in that both management and workers now know that safety doesn't cost—it pays. Therefore the best approach to increasing safety is through mutual cooperation.

Labor leader at President's Conference on Occupational Safety points out that we are members of groups, such as the family, church, union local, lodge and so on. Safety can and should be promoted through these groups, especially the home and family. The big problem is to generate participation so that safety will be as mobile as the hazards it fights.

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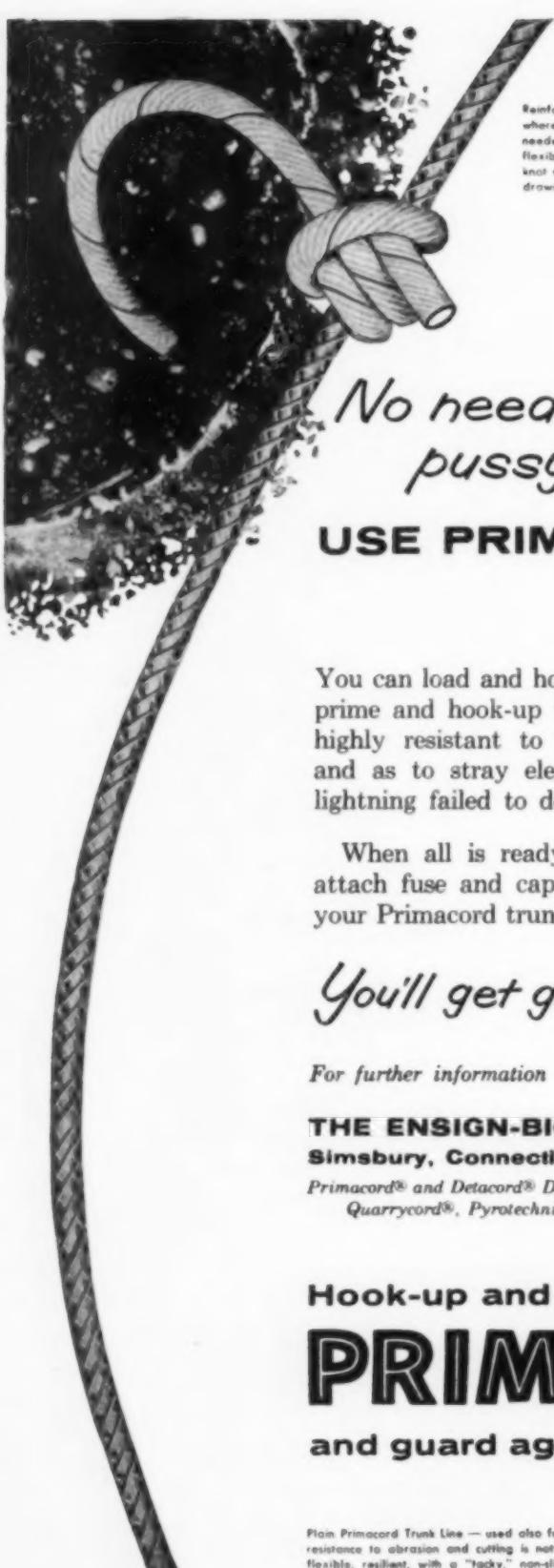
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Wellington, Ohio





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P-4

Devoted to the Operating, Technical and Business Problems of  
the Coal-Mining Industry

**COAL  
AGE**

MAY 1958

IVAN A. GIVEN, EDITOR

## First of the First

DEPRESSIONS are a time of testing and the present one is no exception—for coal as well as for all industry. The testing, in the last analysis, is that of managerial judgment, skill and stamina, and the period covered by the testing is not only the present but also the past. This means that ability to weather an economic storm reflects in large part the long-term soundness of management policies—policies that insure not only the cost, quality and service required for a firm market position, but also working capital and reserves adequate for tiding over a period of rough going.

These are fundamentals that apply at all times, whether good or bad. In bad times there is, in addition, a premium on another ingredient—the ability to resist excessive price concessions not warranted by rises in productive efficiency. Unwarranted price cuts create no new business. All that they accomplish are temporary switches of existing tonnage to the ultimate detriment not only of the ones who lose but also the ones who experience the temporary gain. This is the clearest of all lessons taught by coal-mining history. So, when first things are being put first in days such as these, top rank should go to price maintenance. It guarantees against getting hurt too badly when the going is rough, and insures ability to forge ahead when prosperity returns.

## Still the Key

MONEY is a major ingredient in efficiency improvements in all industry, though it must be accompanied by a high degree of managerial and supervisory skill to make it most effective. As of mid-1957, the National Industrial Conference Board notes, the average capital investment was \$16,000 per production worker. The coal rate is comparable, and in many instances is much higher. That, along with more competent managers and supervisors, is a major reason why coal prices are no higher today than they were ten

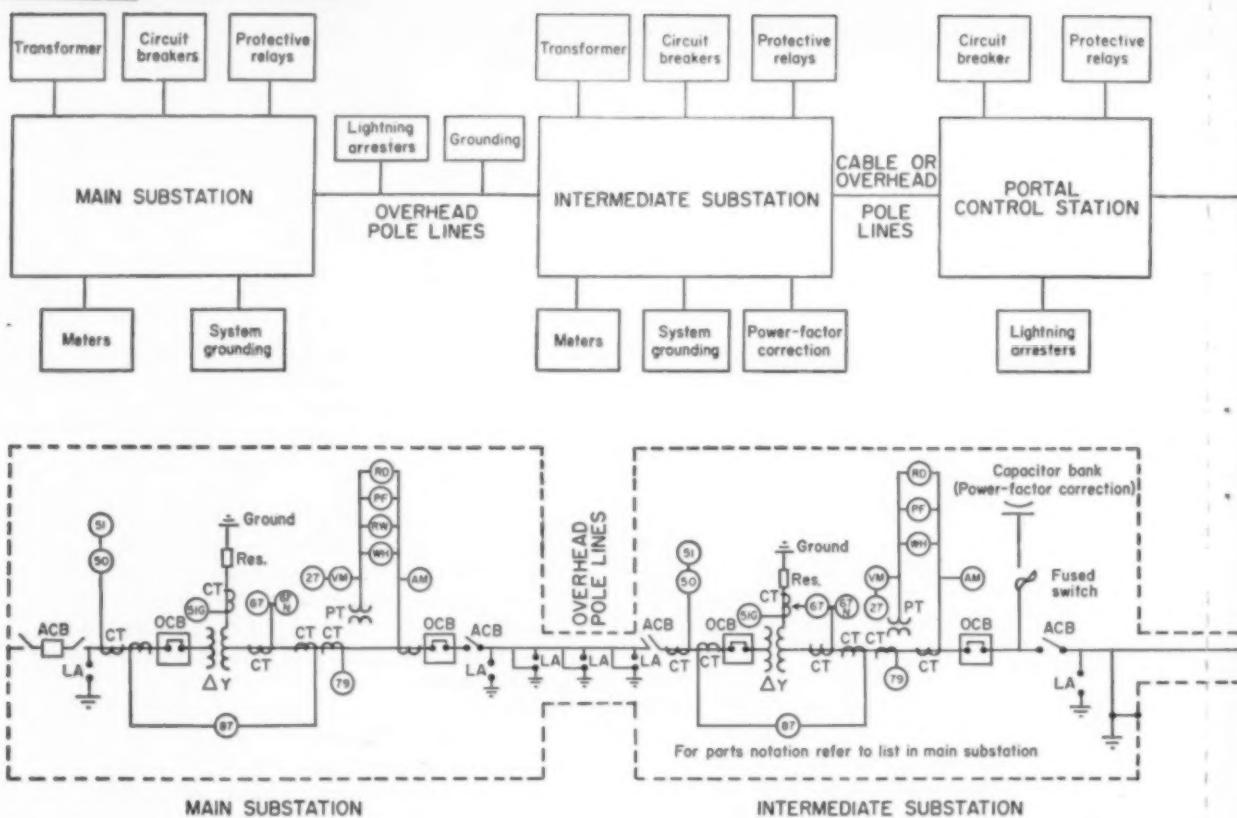
years ago, with consequent improvement in coal's competitive position. Few other major industries, including coal's competitors, can match that record, or can look forward to assured additional opportunities for keeping costs down for some time to come.

What are some of the things coal spends its money for now, or will spend it for in the future? The record appears month by month in *Coal Age*, and this month it includes AC facilities for underground mining tomorrow, and new equipment, materials and techniques for shaft-sinking today. "Technique" is a term to reckon with even more than "investment," since technique reflects managerial and supervisory skill, ideas and developments, without which investment is less effective or perhaps not effective at all. "Invest" should continue to be a key word for progress, but stress on increasing the skills of management and men is even more important.

## Climate Creation

ANOTHER SEASON draws to a close for those affiliated with the Speakers' Bureau of the National Coal Association, even though a few engagements customarily are filled in the summer months. Again it can be counted as a successful season despite the fact that there is no positive way of determining what the speakers' efforts have meant or will mean in terms of tonnage held or gained now or in the future.

Basically the value of speaking on coal lies in the fact that it is an opportunity to create a favorable climate for coal available in no other way. The audiences normally include men in position to do coal some good when the occasion arises, and the coal man appears before these audiences under circumstances more favorable than he could expect to attain on any other basis. The impact of hundreds of addresses to thousands of business men and community leaders over the years is bound to be significant. The principal need is more men to talk to more audiences. The effort is not too great and the benefits are very real.



## The Operating Man's Guide to . . . AC for Deep

By Daniel Jackson Jr.  
Assistant Editor, *Coal Age*

### AC Theory

WHAT IS AC and how does it differ from DC? Webster defines AC as "a periodic electric conduction current which reverses its direction at regularly recurring intervals. As used in electrical engineering practice, its frequency is determined by the frequency of the alternator supplying it and its successive half waves are similar in shape and area. The standard commercial frequencies are 25 and 60 cycles per second." This means that with AC the current flowing in electrical conductors alternates between positive and negative at a rate of 25 or 60 cycles per second. One complete cycle (360 deg) consists of

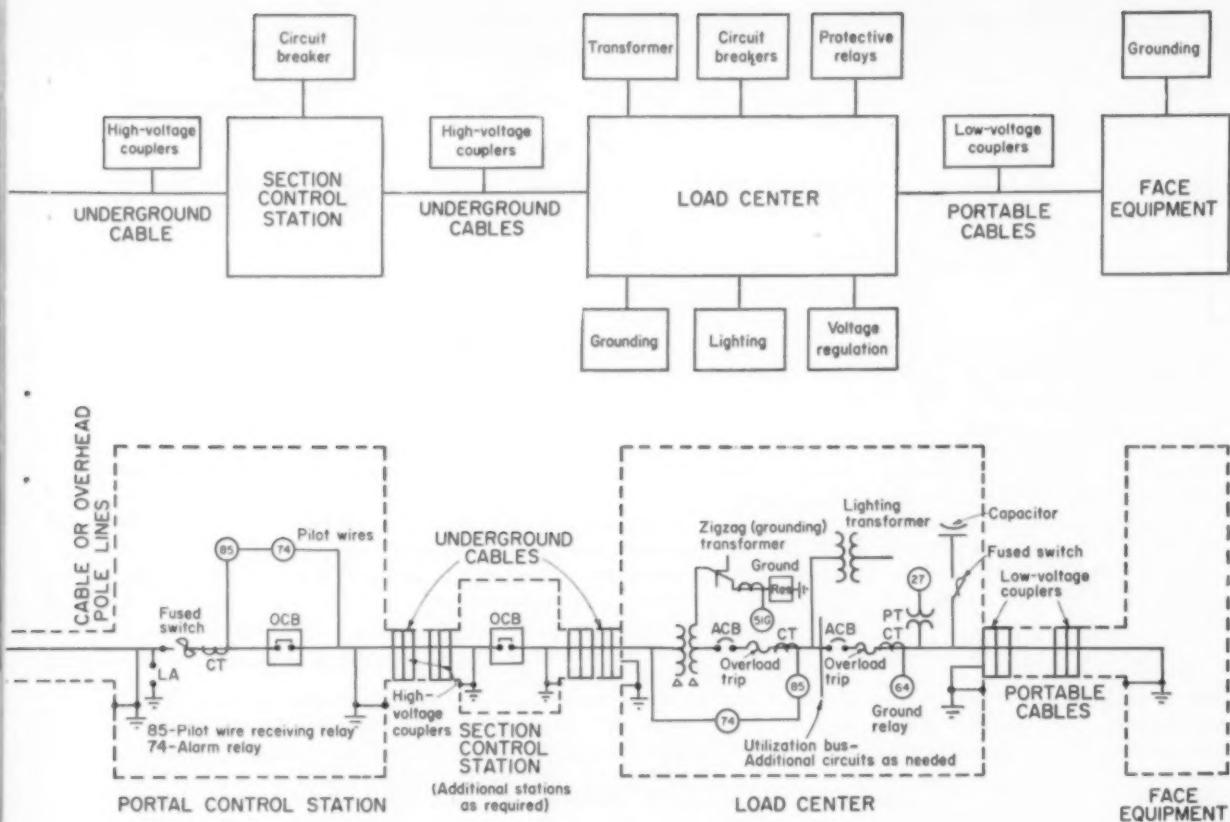
a half positive and half negative wave, each similar in shape and size. In comparison, DC flows in one direction, always with positive polarity.

#### Inductance and Capacitance

When current flows in conductors, a voltage also is impressed across the conductors. It can be represented by a wave similar to the current wave. The voltage wave reverses its direction ahead of or behind the current wave, depending on the amount of inductance and capacitance in the circuit. The degrees of difference between the two waves at zero is called the phase angle and is the number of degrees by which current lags or leads voltage. The accompanying sketch shows the current lagging. This angle of lag or lead is also related to power factor. The cosine of this angle, termed  $\cos \theta$ , is the power factor.

When current lags the voltage, the power factor is said to be lagging and the circuit is predominantly inductive. Inductance is opposition to the flow of AC and is present in AC circuits and conductors but not DC. It is produced by a magnetic field which induces a voltage in such a direction as to oppose the change causing it.

A circuit has a leading power factor when the current leads the voltage. It then is predominantly capacitive. Capacitance oppose changes in voltage and is produced by an electric field set up around the circuit or conductor when current is present. When voltage increases in a circuit energy is transferred from the circuit to the electric field and when it decreases, energy is transferred from the electric field to the circuit. This indicates that energy is stored in the electric field and, when the voltage in the circuit decreases, this stored



## Mining . . . What it is . . . How it is used

energy tends to give the line voltage a boost, attempting to maintain a constant voltage.

### Power From AC

The product of current and voltage produces still another wave form called power and is analogous to power produced in a hydraulic system. The force of a stream of water reflects a combination of pressure in pounds per square inch and volume in gallons per minute. In an electrical circuit voltage is the pressure and current is the fluid. Although voltage and current are negative during half their cycle, the power wave is almost always positive. It reverses direction at the phase angle between voltage and current and assumes a negative polarity for a short time only. This, and the fact that power transfer is not constant in magnitude, i.e., pulsates with time, are undesirable fea-

tures in AC. However, these disadvantages are small compared to DC, mainly because AC permits the use of transformers.

Power in an AC circuit depends on the voltage between conductors, the current flowing in the conductors and the power factor. The higher the voltage the lower the current and the lower the current the smaller the wires which can be used to transmit it. Transformers enable power to be stepped up or down as the case may

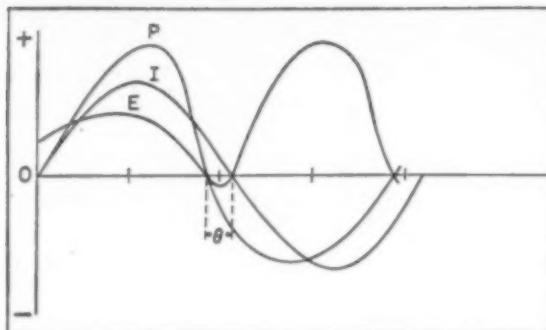
be. When power is to be transmitted over long distances it is better to use a higher voltage, thus reducing line drop and wire size. At the end of the transmission line it can be stepped down to the desired voltage level.

Mutual inductance is the phenomenon on which both transformers and AC motors operate. A characteristic of the AC circuit is the fact that it produces a flux—the equivalent of current in a magnetic circuit—which links it with another circuit near it. As the current in the first circuit changes (alternates) it causes a change in the mutual flux which in turn induces a voltage in the second circuit. Induction does not take place in a DC circuit because the current does not change. Therefore, it is not possible to use transformers in DC circuits.

It was noted previously that the instantaneous power wave is negative for a short time. In other words, as

### Tear Out to File

The pages on which this "AC for Deep Mining" feature appears have been perforated to make it easy for you to remove them for filing—another example of the steps Coal Age is taking to make the publication more useful to you.



CURRENT (I), VOLTAGE (E), POWER (P) AND POWER FACTOR ( $\theta$ ) normally take a wave form.

the wave travels from positive to negative and back to positive, it becomes zero for an instant. Bear in mind that this is an instantaneous wave and that there are 60 of these waves (cycles) per second which produces an average positive wave over a period of time.

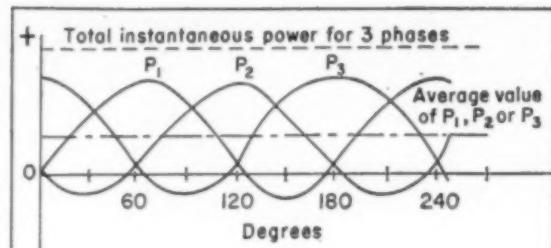
This pulsating or alternating action of the power wave does, however, affect the performance of single-phase motors. On the other hand, three-phase motors do not have this pulsating action.

The difference between the two can best be understood when it is realized that three single-phase power waves are impressed upon the stator of a three-phase motor at the same time, while the single-phase motor has only one wave impressed upon its stator. The combined average instantaneous power wave of the three phases results in a constant wave, thus eliminating the pulsation present in each line of the system. This is the main reason why three-phase motors are more widely used.

From purchased power to actual utilization voltage, AC power offers many advantages. However, AC has more elements of regulation than DC. These elements include power-factor, line reactance and high motor starting currents. The elements of concern in DC are resistance and low motor starting currents.

### Power Factor

The power factor of a circuit, as noted previously, is the cosine of the angle of lag or lead of the current with respect to voltage. If an AC circuit contained only resistance there would be no problems with power factor because, in a pure resistive



TOTAL INSTANTANEOUS POWER of three-phase and single-phase systems is indicated by the dash lines.

circuit, the current and voltage are always in phase. But, in AC there are two other elements to contend with. These are inductance and capacitance, as explained previously, and they are the reason why voltage and current are never in phase in an AC circuit. These elements do not contribute anything to the average or active power, or the power that performs useful work in an AC system. As the current and voltage increase and decrease, energy is transferred between the magnetic and electric fields and the circuit. The effect of this transferring of energy is a false load that burdens the system as much as an actual load. This energy is called reactive or wattless power. It is measured in reactive volt-amperes and is abbreviated *var* or *kvar*.

Thus, an AC circuit contains two types of power: first, one that performs work (active or average power) and, second, one that does not (reactive or wattless power).

When a circuit has a poor power factor it is usually a result of inductive loads in the system. Since inductance causes a lagging power factor and a capacitance a leading power factor, it follows that the addition of capacitors to a circuit would tend to reduce the lag. This would tend to improve the power factor by causing it to approach 1 or 100%, which is unity power factor. However, it is not economically possible to have a unity power factor. A 0.95 or 95% power factor is considered good.

### Line Reactance

Two types of reactance exist in AC transmissions lines and again these are inductive and capacitive. They affect the transmission of power just

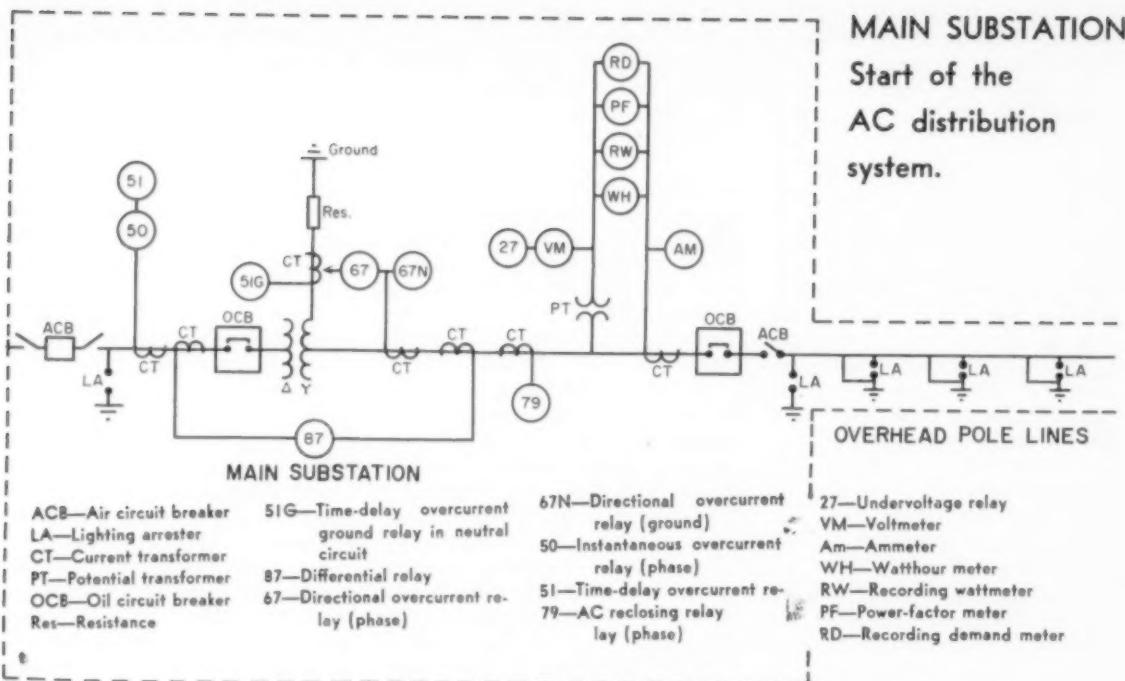
as in other circuit equipment. Basically, reactance is the sum of the inductance and capacitance in a circuit. The amount of reactance in transmission lines depends, in part, on the spacing and size of the conductors.

### High Starting Currents

Current required to start an AC motor depends on the characteristics of its load and the starting method employed. Generally, a motor requires several times its normal current during the starting period. The rotor resistance also determines the amount of current that a motor will consume to produce a needed torque. High rotor resistance produces high torque and low rotor resistance produces a low torque. The load that the motor will be required to handle will determine the rotor resistance. Higher resistance causes power factor and efficiency to decrease accordingly.

In AC motors, low voltage affects the torque as the square of the voltage but speed is maintained. On the other hand, DC motors tend to lose speed but maintain torque when voltage drops.

Pull-out or maximum torque of an AC motor is attained when the load applied to the rotor causes the rotor to slow down and fall back in space-phase far enough to lag the rotating stator field by 90 deg. When this angle is exceeded the motor stalls. The pull-out torque limitation of AC motors is one reason why such motors are not used on haulage locomotives. In many instances it would be impossible to get a trip started because the torque would be so great that the motor would probably stall each time the load was applied.



## Operation of the AC System

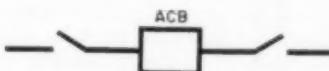
AN ALL-AC mine power system starts with a main substation where power is purchased at a high voltage, usually 13,000. The main substation may reduce the voltage to the final levels of 220 or 440, or it may drop it only to 7,200 to 4,160 or 2,400 for transmission to load centers for final reduction. The number of voltage steps and the choice of voltages depends upon system load, transmission distance, safety and limitations imposed by mine laws. The usual practice is to omit the intermediate station. However, it is included in this report on AC to bring in all major variations in an AC system.

With the inclusion of the intermediate substation, the main divisions in an AC system are shown in the block diagram on the previous two pages of this report, while the one-line diagram shows the individual components making up each division. These diagrams employ the standard symbols and numbers adopted by the American Standards Association. These are used to promote familiarity with the electrical symbols used in circuit diagramming.

### The Main Substation

Although main substations usually are owned by the power company, various switching and protective devices normally are coal-company property. The selection and arrangement of this equipment determines how well the complete system performs under normal and abnormal conditions. The best normally is as shown in the diagram for the main substation on this page. What the units do is detailed in the following:

#### Air Circuit Breakers



Circuit breakers or disconnect switches are one of the protective devices used in electrical circuits. They are knife-blade-type disconnecting switches which provide a means of isolating transformers and associated equipment from the source of power. These switches are not installed in the line to interrupt load

but are used as a visible means of isolating the equipment when repairs or construction work are being carried on. This type of switch provides a large air space between live wires and equipment which prevents leakage of power to the equipment. It also permits a visible check by workmen that the system is disconnected from the power source. These switches are usually mounted on overhead pole lines and are opened and closed manually by insulated pole hooks that engage holes on the end of each blade.

#### Lightning Arresters



Protection against overvoltage caused by lightning is accomplished by installing lightning arresters in the system. They are used to reduce power interruption and prevent equipment damage. How much protection against lightning a system should have depends on the location of the system and whether or not the location is subject to frequent light-

ning strokes. Installation cost vs. equipment value and lost time due to interruptions must also be considered.

Lightning strokes result in an over-voltage in the conductors, by providing a path for it to travel between line and ground without permitting normal current flow. After a surge of lightning has been directed to ground, the arrester must prevent current in the system from flowing to ground. Summing up, arresters perform two operations: (1) direct the surge to ground and (2) stop the current in the system from flowing to ground after the surge has passed.

Several types of arresters are available for various applications:

1. Distribution-type.
2. Line-type.
3. Station-type.

Distribution-type arresters are used to protect transformers, cables, capacitors, meters and circuit breakers. They are designed to permit mounting on poles and crossarms. They are relatively inexpensive and are easy to install.

Line-type arresters are similar to the distribution type but are more suited for protecting small equipment in the medium-voltage range.

Station-type arresters provide better protection than the other two. They are used, as the name implies, to protect stations and other equipment of extreme importance.

### Current Transformers



CT



PT

The next symbol in the one-line diagram represents a current transformer. A discussion on this component along with potential transformers, will appear later in the section on relays since their function is concerned with the application of relays.

### Oil Circuit Breakers



OCB

On high-voltage systems the oil type circuit breaker is used to guard against overloads or short circuits, and also to permit sectionalizing the system to isolate trouble. It should be noted, however, that air circuit breakers are being used more and more on high voltage systems.

The amount of protection that an oil circuit breaker provides depends primarily on the relays associated with it. These will be discussed in a later section on protective relays.

Circuit breakers are normally designed for momentary and interrupting rating, and with automatic interrupting features. Momentary rating is the amount of current that a breaker will withstand, including short circuits from all sources. The breaker should safely open on any current within its rating without being damaged.

The interrupting rating is the ability of a breaker to interrupt a fault current between the maximum and minimum designed voltage rating of the breaker. The rating is measured in megavolt-amperes, abbreviated *mea* or *arc kva*. The *mea* value is determined by multiplying the kilovolt rating of the breaker by the kiloamperes of the fault current to be interrupted. The *arc kva* value is found by multiplying the kilovolt rating and the amperes.

Interrupting fault currents automatically is achieved by built-in tripping devices or by relays connected to the breaker. There is a wide variety of relays to choose from and the selection depends on the amount of protection the system requires.

Facilities at the main substation normally consist of a master oil circuit breaker (one that provides protection for the overall system) and several branch circuit breakers that feed various loads. The master breaker provides additional back-up protection in case a branch circuit breaker fails to operate when a fault occurs in any one branch. The purpose of branch circuit breakers is to isolate trouble in a particular branch without interrupting service to the other branches.

### Transformers



The primary function of a transformer is to change electrical power from one voltage range to another. This makes it possible to transmit, distribute and utilize AC power at the most economical and effective voltages. Unlike AC, DC power must be transmitted from converter, generators or rectifiers to working areas at essentially the same

voltage. This imposes a limit on the amount and distances DC can be transmitted.

Transformers contain primary and secondary windings. The primary receives current at the input voltage and the secondary sends it out at the output voltage. The ratio of primary to secondary voltage is the same as the ratio of turns in the primary and secondary windings.

Practically all transformers are single-phase or combined three-phase units, the latter combining all phases in a single case or tank. A three-phase distribution system may employ a single three-phase transformer or three single-phase transformers. The selection is usually a matter of preference. Single-phase units are in the majority but three-phase transformers are gaining in popularity.

In an AC system, the extent of transformation depends on the size of the system (load demand), distance voltage is to be transmitted and voltage limits imposed upon the system by mine laws. Distribution voltages for mining normally range from 13,000 to 220 with transformation taking place as lower voltages are required.

Transformer connections in distribution system are normally delta-Y or delta-delta. These symbols or names have been applied to the different connections because the actual connections resemble these symbols. The delta-Y connection is used on higher voltages and delta-delta on lower voltages. However, this is not a final rule.

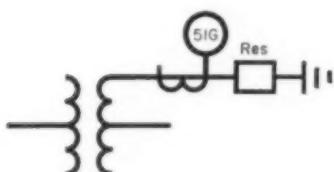
Most transformers are equipped with tap changers to change the ratio of the winding. The primary purpose of taps is to increase or decrease the voltage level of the system. Tap-changing does not affect the voltage drop or improve voltage regulation.

Transformers are rated in terms of kilovolt-amperes (*kva*). The prefix *k*, or *kilo*, is equal to 1,000 and is used primarily to reduce volt-ampere values to more convenient number; for example, a 150-kva transformer is the same as a 150,000-va unit.

Since the voltages of transformers are fixed, the rating of an individual unit is determined by the amount of current flowing through it. Care must be exercised in selecting the correct rating to insure efficiency and adequate power for the system and loads, but capacity should not exceed the horsepower rating of the system.

by any great degree because it results in an increase in wattless current and the imposition of a greater false load on the system.

## System Grounding



The most used and best way of grounding distribution systems is the neutral ground method. Since it provides better protection and is simpler, the following discussion will be limited to this system.

Neutral grounding connections can be obtained in two ways:

1. Connect transformers delta-Y.
2. Use zigzag grounding transformers when delta-delta connections are used.

The chief advantages of the delta-Y connection are that it provides a neutral connecting point for grounding purposes, and is the simplest and best way of stabilizing the Y secondary neutral. This method does not require extra equipment to establish a neutral.

If the system is connected delta-delta, there is no neutral connection point available. However, a neutral can be established by installing zigzag grounding transformers. They consist of a three-phase winding with no secondary. Each phase of this transformer is connected to a different line of the system. The grounding transformer neutral is then the same as in the Y-connected system.

When a neutral has been established for the system, there also must be a method of grounding the neutral. The most desirable practices in mining are: (1) resistance grounding and (2) solid grounding. Resistance grounding is more widely used, especially underground.

In resistance grounding the neutral is connected to ground through one or more resistors regardless of whether the neutral is connected delta-Y or delta-delta with a grounding transformer. The main reason for using resistors in the grounded-neutral system is to limit the amount of

current during faults. The advantages are as follows:

1. Minimize electric shock hazards to personnel.
2. Reduce burning effects in faulted electric equipment.
3. Reduce mechanical stresses in circuits and equipment.

Solidly grounded neutrals are connected directly to ground without any provisions for limiting current. The disadvantage of this method is that personnel are exposed to large ground currents when faults occur.

## Relays



Relays detect trouble in a distribution system. They are used in conjunction with circuit breakers to control the operation of breakers when faults occur.



**(Current and Potential Transformers)** Relays are connected

into the system through current or potential transformers, often called instrument transformers. Their purpose is to insulate the relays from line voltage and to reduce line current and voltage to values that can be applied to the sensitive mechanisms that are common in relay design. Current transformers are connected in series with the transmission lines. Potential transformers are connected across the lines. These transformers operate on a fixed ratio, for example, a current transformer having a 600-to 5-amp ratio will deliver 5 amp to the relay when a current of 600 amp flows in the line.)

Relays are classified with respect to the rate of speed at which they operate. Basically, these classifications are: (1) instantaneous, (2) high-speed, (3) time-delay and (4) combinations of the three.

Instantaneous relays, as their name implies, operate within a few cycles after faults are detected. High-speed relays differ from instantaneous in that they operate within three cycles or less.

Time-delay relays are those that do not operate until a predetermined time has elapsed. The time ratings are usually adjustable but there are a few that have the time rating built into them.

Distribution systems can be protected from almost any fault condition that might develop within a system by proper selection and coordination of relays. The various relays are named with reference to the protection they provide. Those most often used are: (1) differential, (2) overcurrent or underright and overcurrent directional, (3) overvoltage or undervoltage, (4) phase balance and (5) reclosure. All are available in various time ratings. There are of course other relays but space does not permit complete coverage.



**Differential Relays** — These relays operate on current induction

and are used to protect AC equipment from internal faults in individual equipment or faults in sections of distribution systems, including transformers, various rotating units and transmission lines. When used on transformers, they operate on a fixed percentage of unbalance (approximately a 50% ratio) between the primary and secondary windings. The principle of the differential relay is that what enters must leave, except that with transformers the ratio will be different, but this difference is compensated for by using current transformer with corresponding ratios. These relays monitor the current of an electrical system or equipment. When the rated percentage of unbalance is reached the relay operates a breaker and interrupts service until the fault is corrected.



**Overcurrent Relays** — These relays are used to trip circuit breakers when abnormal currents of two to three times the normal flow in the circuit. They are adaptable to transmission lines, buses, feeder circuits, transformers and motors.



**Directional Overcurrent Relays** — These differ from straight overcurrent relays in that they are primarily used for ground protection. They are designed to measure fault current in one or two directions. Whether faults will cause flow in one or two directions is determined by system conditions.

tions. The two-directional relay is used on transmission lines where ground-fault currents flow in either direction. These relays provide directional as well as overcurrent protection. Other directional relays provide phase protection.

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#### Overvoltage Relays

These serve primarily the same purpose as overcurrent relays except that they are connected in the line by potential transformers which measure the voltage across the lines. When an overvoltage exists the relay operates and opens the circuit breaker. Overvoltage relays are not too frequently used in main substations but are included in the list because they can be employed.

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#### Undervoltage Relays

Like undercurrent relays, undervoltage relays indicate when voltage is not up to the level it should be. Undervoltage values result in the breaker tripping and staying out until the undesirable condition is corrected.

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#### Phase - Balance Relays

These protect the system from faults occurring in any phase of a three-phase system. Quite often a fault current will not be large enough to trip the overcurrent relay but will operate the phase-balance mechanism, which is more sensitive, because of an unbalance in the three phases.

79

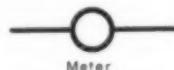
#### Automatic Reclosing Relays

These are used to automatically reclose electrically operated circuit breakers. They limit the duration of power failures in many instances where faults clear themselves quickly. Most reclosing relays attempt to close a breaker three times before locking it out. The time interval between reclosures is predetermined. Lock-out means that after the third attempt to keep the breaker in fails, the relay will not function until it is reset manually. Such relays can be designed to operate more than three times before locking out, with the number of reclosures depending on the requirements and design of the system.

With the wide variety of protective relays available today, no distribution system need operate without

complete protection against faults. However, it is possible to overprotect a system or to have relays that will not operate under fault conditions if selection and arrangement have not been coordinated.

#### Meters



Indicating and recording meters or instruments are used to measure the different value of voltage, current and power in distribution systems.



Voltmeters—Voltage values need to be checked frequently to insure that an adequate voltage level is maintained. Voltmeters are used for this purpose and are connected in parallel or across the transmission lines. They measure the average voltage of the system and normally are of the indicating type which shows the voltage level as it varies with the applied loads.



Ammeters—Current (amperes) is measured by ammeters connected in series with the transmission lines. They indicate the extent of the load the system is pulling and show whether or not it is overloaded.



Power Meters—Power is measured in watts and watt-hours, and when large quantities are consumed the units of measurements are kilowatts (kw) and kilowatthours (kwhr) and are derived by dividing the basic units by 1,000. Basically, there are three types of wattmeters: (1) indicating, which show the average rate at which power is consumed, (2) recording, which record the average value on special graph paper and (3) watt-hour, which sum up and record the total energy consumed during an interval of time.

Actually these meters consist of a voltmeter and ammeter combined. The voltage and current values are converted to power by means of voltage and current coils in the meter. They indicate the average power delivered to the system, and, are connected in the same manner.



Power - Factor Meters—Another value of importance that needs meas-

uring is the power factor of the system. Meters for this purpose indicate the relation of the phase between the line current and line voltage which actually is the same as the power factor of the load.



#### Demand Meters

Still another value that must be measured is the rate at which power is consumed. Instruments or meters for measuring the maximum demand during an agreed period of time, usually a month, are known as demand meters. The demand or peak power is the maximum amount of energy consumed in any consecutive number of minutes, say 15 or 30 min, during the month. Demand is measured in kilowatts and is the average rate of consumed energy during the peak period. This method of establishing the maximum demand rate does not penalize the company for very short peaks. However, if the peak lasts the full set-time interval of the meter, a penalty would be imposed upon the company.

The next three components appearing in the one-line diagram are an oil circuit breaker, a disconnect switch and a lightning arrester. These have been discussed previously under their respective headings.

## Overhead Pole Line

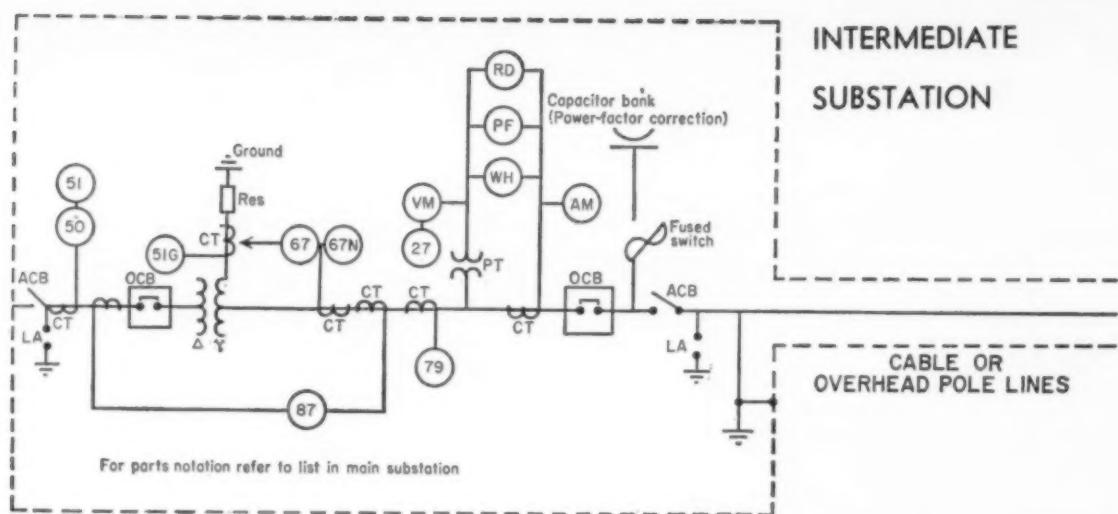
Most distributions systems include overhead pole lines even though, in some instances, they are short. The two-step voltage arrangement normally requires more overhead construction than the one-step system. Transmission of high voltage from main substation to intermediate substations often involves several miles of overhead power lines.

The following discussion on overhead pole lines will be limited to the electrical factors affecting the transmission of voltage (line reactance), grounding and lightning protection.

#### Line Reactance

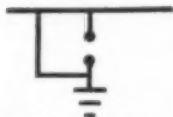
Reactance, discussed in the section on AC theory, is caused by the inductive and capacitive characteristics of AC transmission lines. The spacing of conductors determines, in part, the amount of reactance in transmission lines which, in effect, causes voltage drop and poor power factor. Lines spaced close together produce more

## INTERMEDIATE SUBSTATION



adverse effects on each other because the magnetic and electric fields are close together. As a result the reactance is greater. To reduce this reactance, lines can be spaced farther apart but even this has its limits because cost, among other things, controls the maximum spacing between the lines.

Two other step factors help to reduce line reactance. They are the size and type of conductors with respect to radius and surface conditions. For the average mine setup, these two factors have very little effect on the amount of reactance in the system. Conductors are usually selected in accordance with the transmission distance and voltage level.



### System Grounding and Lightning Protection

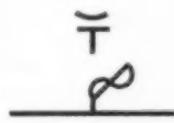
—See discussion earlier in this report. In addition, it should be noted that a ground wire normally accompanies the power conductors, with lightning arresters installed at intervals of approximately 1,500 to 2,000 ft. The ground wire is connected to the ground side of the lightning arresters. This method has proved most satisfactory and is widely used in mine distribution systems, although it is not uncommon to find a system without a ground wire.

## Intermediate Substations

Since most of the components included in the main substation are

also used in the intermediate substation the reader is referred to that section of this report for a discussion of their purpose and application. It should, however, be noted that protection for intermediate substation should be as complete as the main substation. The rating of the components will be correspondingly less with lower voltage and load. Power-factor correction is the only major variation in the two substations.

### Power-Factor Correction



There are few AC systems that do not require power-factor correction. Correction can be made either at the substation for system correction, at the load for individual correction or both. This latter is not an uncommon practice. As a matter of fact, power-factor correction is being treated with as much importance today as any other phase of the power system. Once the money-saving potentials of power-factor correction are recognized, it will be applied to more systems. The saving is not in power bills alone but also in the reduction of load on the system which permits equipment to operate on a more normal power supply, thus reducing repair bills on other equipment.

The device most often used in mining systems to correct power factor is the capacitor. This, however, is not the only means. Other correction includes the use of synchronous mo-

tors, and the proper selection and application of any induction motors.

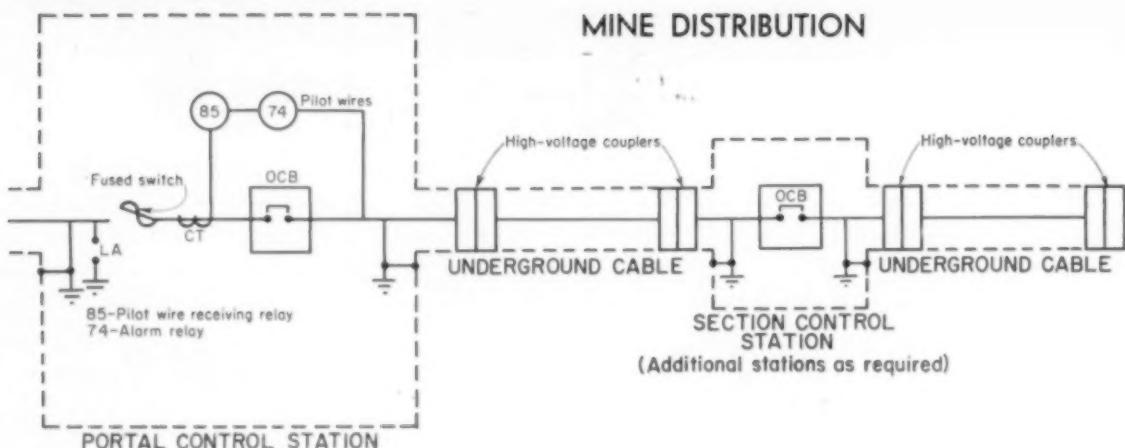
Capacitors can correct and bring power factor up to 90 to 95%, which normally takes the mine out of the penalty area and reduces the reactive power in the system. Some systems may require overall correction and also correction at the center of groups of induction motors. Still other systems would require correction at only one of the two locations.

Correction at the intermediate substation consists of installing a capacitor bank with sufficient *ckvar* (capacitor kilovolt-amperes-reactive) to bring the power factor to the desired rating. The *ckvar* value is determined by the amount of *kw* and *kvar* of the system. From these values the *kva* and power factor can be calculated.

Shunt-type capacitors are used in most cases. They are made up of a group of conductors, usually plates, so arranged that a large electrical charge can be stored in them. Electrical charges are stored when a potential difference exists between the conductors. Putting it another way, a capacitor stores electrical charges when the potential of the conductors is increasing and discharges it when the potential is decreasing.

Why capacitors actually correct power factor might be better understood if the inductance is considered positive and the capacitance negative. Thus, when capacitance (*ckvar*) is added to a circuit it subtracts from the inductance (*kvar*). Therefore, the *kvar*, or reactive power is reduced, which improves the power factor.

(Continued on next page)



## Portal Control Station

At this point of the installation there are several standards for distributing AC power underground. These standards provide safety for men and equipment and contribute to an efficient underground distribution system.

The power should enter the mine as near the load center as possible for two reasons:

1. To reduce the amount of high-voltage cable underground.
2. To minimize voltage drop between the substation and load center.

In most cases the substation—in this instance the intermediate, though it could be the primary unit in a one-step voltage-reduction system—will be located near the place where power is taken underground. Consequently, it is not necessary to provide an extra switching station equipped with circuit breakers and necessary protective relays, such as, overcurrent and phase balance, as well as ground-fault detectors and lightning arresters. The intermediate substation is equipped with these devices. On the other hand, if the entrance is located some distance from the intermediate substation it would be necessary to provide a separate installation including all the devices listed. These components were covered earlier in this report. However, the ground detectors are quite different, as indicated in the following.

### Ground Protection

Protection of underground high-

voltage systems can be achieved in several ways but probably the best method is the pilot-wire system employing the differential-type relays previously described. A small amount of line current is permitted to flow in the pilot wires through the secondary of current transformers. These pilot wires are carried with the power conductors.

### 85—Pilot-Wire Relays

Referring to the previous discussion of differential relays, these operate on a balance principle. The amount of current at one end of the line is the same as at the other end. When the current in the pilot wire becomes unbalanced, due to faults in the line, the relay operates and opens a circuit breaker. This method provides phase-to-phase as well as ground-fault protection.

### 74—Alarm Relay

An additional feature of this protective system is a relay for continuously checking the condition of the pilot wires. If the wires become short- or open-circuited, the relay will operate, indicating that the system is no longer protected against faults. The lines can then be inspected and repaired, and the system restored to normal.

## Underground Distribution

In conjunction with the surface switching arrangement, high-voltage

cables entering the mine through boreholes or shafts are equipped with circuit breakers at the bottoms of these openings to interrupt power feeding into the mine in case of emergency and also for repairs.

### Cables

Insulated multiple-conductor cables equipped with ground wires and a conducting shield over both ground and power conductor are used to transmit high voltage underground. Type SHD cables with adequate kilovolt rating are used in most installations. The length of these cables normally is kept to a maximum of 1,000 ft. They are connected by high-voltage couplers or potheads.

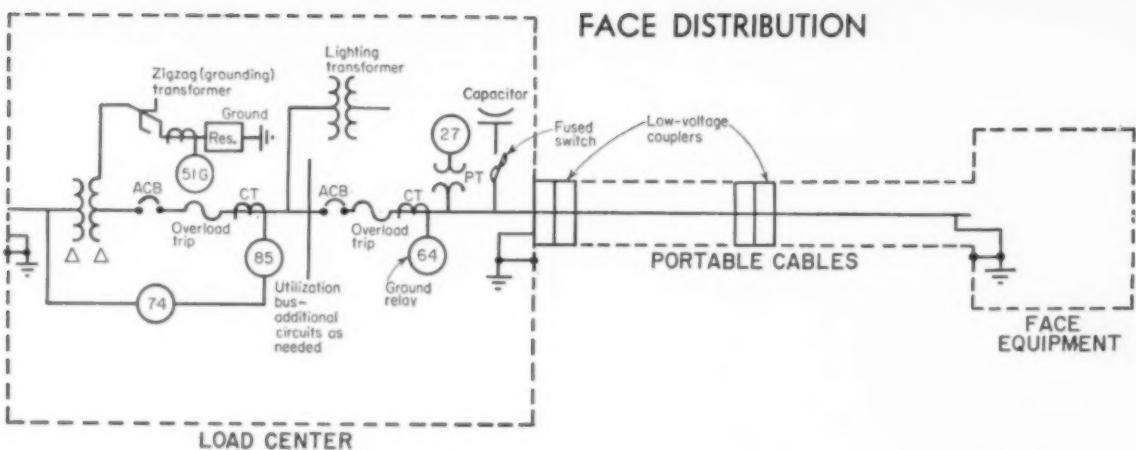
### Couplers



From a safety viewpoint it is better to use couplers equipped with mechanical locking. This permits only authorized personnel to disconnect the couplers, and also eliminates the possibility of persons connecting them while repairs are being made.

## Section Control Station

As transmission distances increase, it is necessary to sectionalize the cables at intervals of approximately



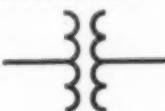
2,000 ft. This means that a circuit breaker or other disconnecting device is installed in the line at these intervals. This also applies to branch circuits that feed other sections of the mine. In addition to the circuit breaker these branch circuits should include necessary protective equipment of the same order as that required when the cables first entered the mine.

## Load Centers

The high-voltage cable is terminated at the load-center with the same type of coupler used in the intermediate sections, with one half of the coupler permanently mounted on the load center frame. The power conductors are connected to the transformer and the ground wires are grounded to the frame.

The purpose of the load center is to reduce the high voltage to actual utilization voltage and to provide switching and fault protection to the branch circuits that it will supply power to. It is a combination power and distribution center. However, individual units may be installed for the same purpose, although the combined unit seems to be preferred.

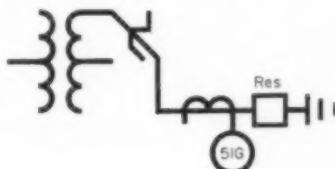
## Transformers



Dry air-cooled or inert gas-filled transformers can be used under-

ground. The former are more widely used because, among other things, the liquid-filled units must have a separate split of air when installed underground.

## System Grounding



As shown in the one-line diagram, the transformer is connected delta-delta and uses a zigzag grounding transformer to establish a neutral. The neutral is resistance grounded and contains the same ground relays as the intermediate substation.

## Circuit Breakers



Back-up protection is provided for each branch or bus circuit by installing a breaker between the transformer and bus. This gives added protection when relays are properly coordinated. It is, however, possible for both breakers to trip at the same time which would cause a delay in the other branch circuits.

But, in most instances, when a fault occurs in any one branch it will trip only the branch circuit breaker and not disturb the others.

Circuit breakers used most often in underground load center are of the stationary mounted molded-case type but other types also are used. They

can be equipped to provide overload, overcurrent and undervoltage protection.

## Relays

Protective relays accompany main as well as branch circuit breakers. The relays employed in load centers provide overload, overcurrent and undervoltage protection.



**Overload Relays**—These are used to protect the branch circuits

against overloads growing out of motor operation. The tripping device is built into the circuit breaker. Instantaneous overloads generally will not trip the breaker but overloads lasting for several minutes will result in interruption.



**Overcurrent Relays**—These are used for ground-fault protection.

They require the use of current transformers and an established ground conductor in each individual branch circuit of the portable cable supplying power to face equipment.

To obtain ground protection in each branch circuit, current transformers are connected in each phase of each branch. The most effective and accurate current transformer for this application is the loop or ring unit. They are not as sensitive to small unbalanced phase loads as other types. Ground faults, on the other hand, cause unbalanced currents to flow, which operate the relay and in turn open the circuit breaker. (Continued on next page)

## COAL AGE SPECIAL REPORT

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**Undervoltage Relays**—These are used primarily because AC motors do not operate efficiently on low voltages. The relay serves as a signaling device to warn operators that the voltage is not sufficient for good motor performance. When this condition exists, the obvious solution is to move the load center closer to the center of operations in the active mining zone.

### Voltage Regulation



Due to the high starting currents of AC induction motors, it is often desirable and sometimes necessary to install capacitors at the load center to maintain a good power factor and to compensate for voltage drop during the starting period. The benefits of capacitors will in most cases, offset the cost of installing them. Power

factor correction, discussed earlier in this report, would also apply.

### Meters



The only measurements of power that would be of benefit at the load center are voltage and current. Whether these values should be measured in each branch or bus circuit is a matter of choice. This information, in many instances, can be of value with respect to the operation of the face equipment.

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### Utilization Distribution

The elements of concern at this point in the distribution system are cables, couplers and ground continuity. Once cables and couplers are installed, the only everyday task remaining is checking ground continuity. This is vital if safety for men and equipment is to be maintained.

Portable cables used in AC utilization are normally Type G—a three-conductor cable with an insulated ground conductor. Cables usually are sectioned in 50- and 100-ft lengths so that their bulk will not be excessive. Keeping cables short helps to reduce voltage drop.

Couplers attached to the ends of the cable sections should be designed to prevent injury to persons connecting and disconnecting them.

Ground-continuity checking devices are difficult to maintain in portable cables, especially those that are spooled on reels. To date there is no effective way of checking this operation other than by test by maintenance personnel.

### Lighting Transformers



Power for section lighting can be obtained from the main load center transformer or by a separate transformer installed for that purpose only. When the main transformer is used a voltage stabilizer is needed to reduce flicker which is caused by fluctuating loads in the system. Consequently, a separate source is more desirable since it is independent from the power system and provides a constant voltage for lighting.



30-inch neoprene feeder belt transfers its load onto a 36-inch neoprene mother conveyor in Powhatan No. 1 Mine.

## Why neoprene belting hauls the coal in Powhatan No. 1 Mine

A big, modern mine like North American Coal Corporation's Powhatan No. 1, in Powhatan Point, Ohio, relies heavily on its conveyor system. Belting must be especially tough to withstand the shock of heavy coal loads and the continuous stress of high-speed operations.

Neoprene belting hauls the coal in Powhatan No. 1 because it gives top performance under these rugged conditions—and because it provides the extra safety bonus of flame resistance. Belts of neoprene will not support combustion.

North American chose neoprene because of the many useful properties it offers in mine conveyor service.

Neoprene is highly resistant to deterioration from oil and grease; stands up under continued abrasion, cutting and chipping. Underground, it protects the belt fabric from acid mine water, mildew and mold. Above ground, neoprene resists the attack of sunlight and weather. This combination of properties adds years to conveyor belt life—helps keep Powhatan No. 1 operating at top efficiency.

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## **Royalty Smokeless Coal uses ABCs Scales to keep accurate check on production**

ABCs Scales at Royalty Smokeless Coal Company, Clifftop, W. Virginia, prove best for weighing and totalizing run-of-mine coal going into preparation plant. Operators asked for and are now getting:

1. A scale that plant people can operate.
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Each of the Fred D. Harless Co.'s seven Macks hauls 2300 tons of coal per week on a two-shifts-a-day, five-days-a-week basis. Mr. Harless depends upon his Macks to give dependable performance, with low maintenance costs, and he has never been disappointed.

## Top profits ride on dependability

"Our Macks haul 20-ton loads of coal over mountainous terrain on both paved and unpaved roads, economically and dependably, even under adverse weather conditions," says Mr. Fred D. Harless, president of the Fred D. Harless Co. of Gilbert, West Virginia. "At one point in the hauling operation the trucks must ford a stream which is often axle deep or over, but the Macks have always come through where our other trucks have failed. We know from long experience that we can depend upon our

Macks for economical operation, more profitable payloads, and the ability to keep on hauling, no matter what the weather or terrain."

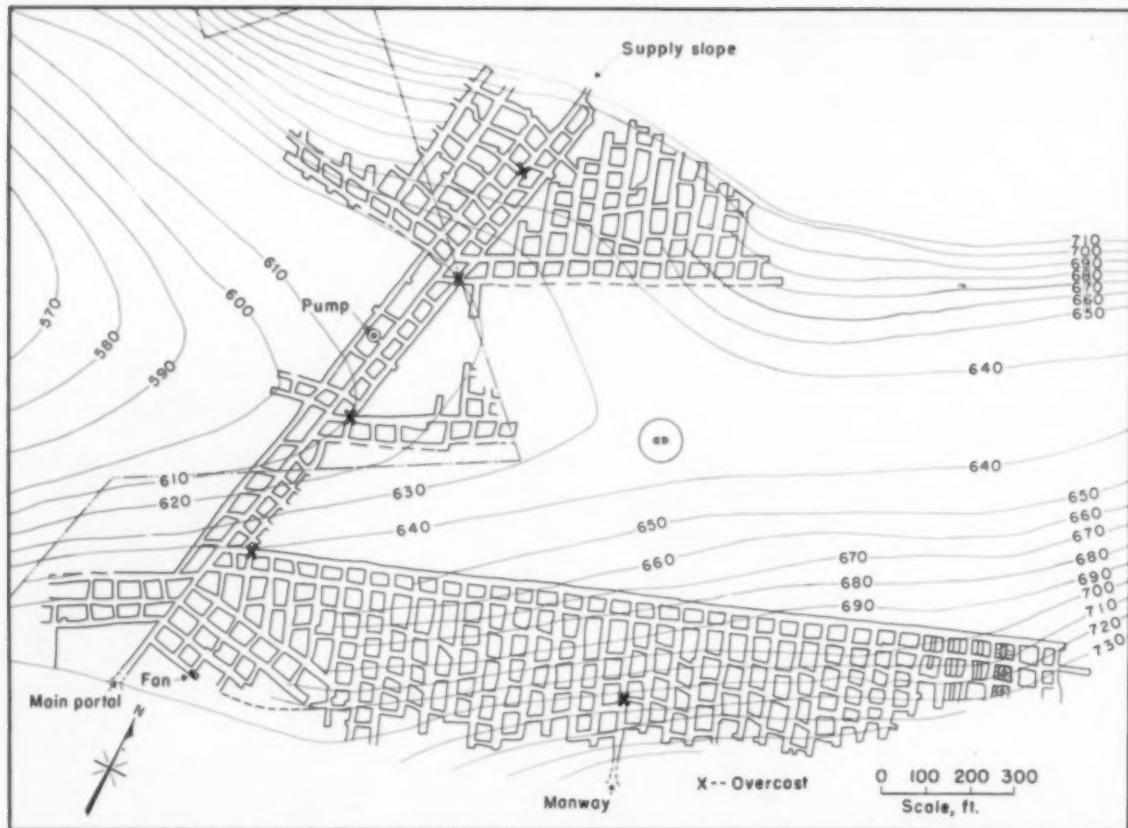
More and more strip mine operators and independent haulers are relying on Macks. In rugged mountain terrain like this, it takes a truck with the built-in endurance, economy and power of a Mack to deliver profit-making payloads—day after day, month after month—with little or no profit-stealing downtime.

Mr. Harless is enthusiastic about

the superior job Macks have done for him. For on-the-job performance figures and names of Mack users in your area, call your nearest Mack branch or distributor. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

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UNDERGROUND PROJECTIONS of Hanover Coal Co. workings provide drainage to single point, contribute to better ventilation and permit streamlined coal transportation and supply handling at 700-tpd mine.

## All-Conveyor Anthracite Mining



ROOM CONVEYOR to gangway unit . . .



To gangway tandem conveyor . . .



To main haulageway tandem . . .

Efficient transportation and well-planned haulage and drainage contribute to high productivity in mining a solid basin area. Intensive safety promotion adds to overall efficiency at Hanover Coal Co.

MAXIMUM RECOVERY with high productivity and maximum safety is the goal at the anthracite deep mining operations of the Hanover Coal Co., Hanover Township, Pa., where the workings and main haulage are fully conveyorized, and where efficient drainage and good ventilation have been given due consideration in projecting the mine. Daily production from the 72 producers in the No. 3 vein averages 700 tpd. General manager of the property, which is a leased parcel of Glen Alden Corp. and which was opened in 1956, is Morgan Bird Jr., and general superintendent is Robert Russavage. Both men have worked closely with federal and state inspectors and engineering consultants in planning for safe development and recovery of an area of solid coal.

The coal lies in a basin, with the main openings consisting of two slopes driven down the limbs of the basin perpendicular to the basin axis. Production gangways have been driven or are projected on 350-ft centers east and west from the slopes. The final bearing of the gangways is selected to provide gravity drainage from all production faces, as shown in the map in which the contour

lines represent the top of the vein of coal.

The coal itself is hard, and drilling is further complicated by the presence of lenses of bone, slate and pyrite. The difficulties presented by these vein characteristics were overcome through careful selection of coal-drilling bits and experimentation with auger sections to find the best types for the conditions.

#### Recovery Operations

As shown in the mine map, an entire section is developed including gangways and up-pitch chambers, or rooms, on advance. The room pillars are split and withdrawn on retreat.

#### Hanover Supervisors

General Manager	Morgan Bird Jr.
General Superintendent	Robert Russavage
Shift Foreman	Edward E. Smith
Shift Foreman	Reynold Vanderhoof
Section Foreman	Miles Carver
Section Foreman	John Senk
Section Foreman	George Boyd
Section Foreman	John Farrell
Company Electrician	Alvin Zim
Outside Foreman	James Murphy
Outside Foreman	Ambrose Shusta
Company Clerk	Samuel D. Bird Jr.

Gangways are 14 ft wide and chambers are from 16 to 18 ft wide on 55-ft centers. Joy and Long conveyors, shaker and chain types, are used to transport the coal from the working faces to the 26-in Joy belt conveyor in the main slope. Two reversible 26-in Jeffrey belt conveyors provide supply transportation and coal haulage in two of the production gangways.

A face crew at the mine consists of a miner and three laborers. Each gangway has a section foreman who concentrates on safety as well as on production.

The coal is hard, as mentioned. However, Hanover officials have worked out methods to achieve maximum economy in face preparation. Drilling is done with air-powered, hand-held Chicago Pneumatic rotary drills. Bits are Kennametal RD 1½- and DL 1¾-in types. Augers are 8-ft Kennametal units with a special pitch on the scroll to provide better cleaning of wet downholes. Some of the holes in the pattern are drilled downward at from 8 to 10 deg. These were difficult to clean until the auger with greater scroll-pitch was adopted. This solution to the problem was worked out in cooperation with Michael K. Cooke, Kennametal representative in the anthracite region.

A 7-ft deep cut from a room face (16 ft wide) requires 16 holes, which can be drilled in about 30 min. Bits are changed after drilling approxi-



To main slope belt conveyor . . .



Past gangway belt transfer . . .



To raw coal pockets on surface .



## "T-1" Steel cuts cost of truck liners 75% —doubles their life

**Five 26-cubic-yard dump trucks** hauling copper ore were lined with USS "T-1" Steel plates more than a year ago. These have been in service at the Copper Cities Division of Miami Copper Company mines at Miami, Arizona.

None of the USS "T-1" Steel liner plates has worn out yet, according to the Acting Master Mechanic. What's more, the old liners became dented and jammed by the impact from large chunks of ore and it was necessary to un-jam them to get

them out. Now, by using USS "T-1" Steel plates furnished to a minimum of 321 Brinell hardness, impact is no longer a serious problem.

USS "T-1" Steel offers a combination of advantages not found in any other steel. It has a minimum yield strength of 90,000 psi, almost three times that of structural carbon steel. It has high resistance to impact abrasion, can be formed and welded, and retains its strength after welding—even when used at temperatures as low as -50° Fahrenheit.

3,877,880 tons of rock were hauled by five trucks like this in less than 10 months.



Dumping a 41-ton load in 10 seconds causes terrific abrasive and scouring action. USS "T-1" Steel gave double the life under these conditions.

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Remember that we also make USS COR-TEN, MAN-TEN and TRI-TEN high-strength low-alloy steels—standards for heavy-duty equipment.

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Columbia-Geneva Steel - San Francisco  
Tennessee Coal & Iron - Fairfield, Alabama  
United States Steel Supply - Warehouse Distributors  
United States Steel Export Company



**United States Steel**



**SCHEDULED BIT CHANGES**, before bits become too dull, lead to easier drilling and longer bit life.



**CENTRIFUGAL PUMP** at main sump discharges to surface through nearby borehole. All mine water drains to this point.

mately 25 holes. The advantage in this is that the bits can be more easily resharpened with a minimum removal of carbide when they are changed before becoming excessively dull. Furthermore, it is easier for the drillers to push the drill when it always is equipped with a sharp bit. Using this system, Hanover averages 40 regrinds per bit.

The coal is broken from the solid by detonating bottom V-cut holes, followed by a row of top holes. Standard delay electric detonators are used to control the sequence.

In recovering a section, the 39-ft wide room pillars are split by driving a 14-ft-wide opening the full length of the room. A 22 deg swivel, or bell crank, then is installed in the shaker-conveyor line to permit driving through the remaining stumps alternating on both sides and coal is taken back where it is possible. In this manner, maximum protection is maintained at all times.

In all such production openings roof support posts are installed as soon as the required 5-ft centers can be cleared of loose coal.

Roof support materials and other supplies are taken into the mine on a supply track which parallels the belt conveyor in the main slope. Track has also been laid in the slope driven down the opposite limb of the basin. The prevailing practice at Hanover is to store underground as much of these materials as possible. This keeps conveyor parts and timber out of the weather and closer to point of use.



**EXHAUST FAN** passing 40,000 cfm ventilate all workings. Use of five overcasts eliminates doors in all-conveyor mine.

### Transporting Coal

The main slope belt conveyor is 1,150 ft long. It discharges into 100-ton pockets from where the raw coal is trucked to a nearby Glen Alden cleaning plant. A 250-ft long tandem chain conveyor extends from the end of the belt to the foot of the supply slope to provide a main transportation medium to the production units along the north limit of the property. Chain conveyors in the gangways are fed by shaking conveyors installed in the rooms.

In most instances, conveyors are limited to a maximum length of 400 ft, making it necessary to use tandem units in long gangways. Drive units

are moved by a special crew of three men using chain hoist to ease the job.

The supply slope serves as a man portal. Under no circumstances are men permitted to travel along the main beltway to or from the surface. The only exceptions are two lubrication patrolmen who service all underground machines once each shift. The patrolmen use Hulbert Red grease in sealed disposal cartridges for easier handling and cleaner application.

The problem of drainage required major consideration as the mine was projected because the cover over the

➤ for immediate delivery:

# new Dravo 3200 h.p. towboat designed to move maximum coal tows faster.....

Dravo's third "3200" towboat is available for immediate delivery. The reasons why it should be considered for immediate purchase by operators moving coal on the rivers can be summed up in one phrase: Profit-making performance at a competitive price.

Profit-making performance, the hallmark of Dravo towboats, means a combination of speed, versatility and efficient operation. The first five months operations of the *Sally Polk*, Dravo's first 3200-class towboat, give a clue as to what can be expected of the Dravo-3200.

Canal Barge Company, Inc., her

operators, report that the *Sally Polk* has lived up to all expectations and has, in actual operation equalled or bettered all trial run figures.

(During trial run tests, the *Sally Polk* averaged 6.5 mph over a one mile course while pushing an 18,000-ton 20-barge tow up and down river.)

Although Canal Barge has not run any conclusive tests of their own, the 148-foot *Sally Polk* has, during routine operation, performed in a very respectable manner:

Pushing an 8500-ton integrated tow, the *Sally Polk* averaged 11 mph pool speed over a 47-hour period.

Pushing a 17,200 ton 100-foot wide

tow, the *Sally Polk* averaged 9 mph pool speed over a short distance.

To operators moving maximum tonnage tows on the rivers, a Dravo-3200 towboat can mean faster, more efficient tows. It can mean better towboat and barge utilization. It can mean increased profits.

A "3200" towboat means profit-making performance.

The price is competitive.

The delivery is immediate.

The towboat is Dravo.

FOR MORE INFORMATION:  
Write or call C. J. Donoghue, Dravo  
Corporation, Pittsburgh 25, Pa.,  
SPalding 1-1200.

**DRAVO**  
CORPORATION



deeper parts of the basin averages only 154 ft. Therefore, the workings intercept much subsurface water. The two slopes and all gangways are graded to provide gravity flow to a central sump at the low point of the workings. The water which collects here is pumped directly through a 6-in borehole to the surface. This system will provide economical water handling for the life of the mine.

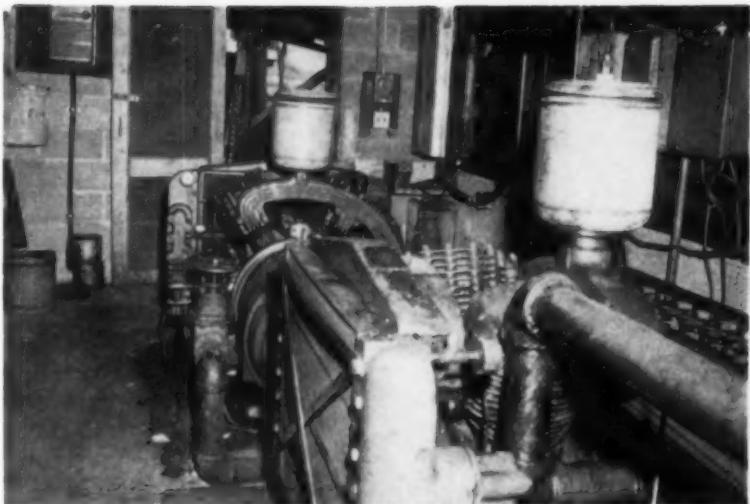
The mine is ventilated by an exhaust fan which passes 40,000 cfm. It was necessary to design the ventilating system to eliminate all doors in main openings to permit full conveyor transportation. This was achieved by employing five overcasts with the necessary regulation to control the separate splits.

The main fan is installed at the top of a 30-ft-deep airshaft near the main portal. Intakes are provided at both slopes and through two chambers driven to the surface, as shown in the map. The air bridges, with appropriate stoppings along main intakes, insure that fresh air comes in along the gangways, enters the inby chambers and returns along the face of the previously driven chambers or along the gobline. One big advantage is that fumes created by blasting do not enter any of the openings used by the men. In addition, all machines are operating in intake air.

Return air from the workings in the side of the basin opposite the fan is conducted to the fan through an airway parallel to the slopes. Stoppings between the beltway and the airway isolate this return air current.

The compressed air for operating the drills is supplied by two air cooled and one water cooled compressors on the surface. Two Joy units are installed at the main portal and a Gardner-Denver at the supply portal. Two steel tanks are installed along the main opening to serve as air receivers, one for each side of the basin. The receivers are interconnected through a valved pipeline to insure continued service even though either compressor station is temporarily out of operation.

All electric motors, underground and on the surface, are operated at 440 V AC. The 2,300-V substation from which mine power is supplied is located near the main portal. Power transformers are also located at the opposite slope and the power is so arranged underground that if



TWO AIR COOLED AND ONE WATER COOLED air compressors in two surface stations supply underground air distribution system through interlocked piping system.

difficulty is encountered on either end, the other can be used to operate the entire mine. A solid copper ground conductor is carried throughout the mine to all electric powered units and terminates in a specially prepared "rod" on the surface. In making this connection, a pit is dug and a layer of sand is spread on the bottom. The ground conductor then is formed into a dishlike arrangement at the bottom of the pit and the hole is filled with charcoal and tamped. This treatment provides a low resistance connection to ground under the soil conditions prevailing at the mine. Furthermore, the charcoal filler can be renewed or replenished as required to maintain the low resistance value of the ground connection.

### Safety Meetings

Completing this picture is the company's interest in safety. The mine is designed and operated in full consideration of the lay of the vein, the desired daily production and the extent of the reserves to be recovered. To achieve maximum overall efficiency, Messrs. Bird and Russavage depend to a great extent upon a safety program which reaches out to inform and to hold the interest of all employees, which includes 98 underground workers and seven men on the surface.

The hub of the program is a safety committee which holds regular monthly meetings. Members of the

committee include top operating and maintenance officials, underground foremen and men from each work classification. The meetings are usually attended by Charles E. Jones, coal mine inspector, U. S. Bureau of Mines, and representatives of District No. 1, United Mine Workers of America. John D. Edwards, mine inspector, Pennsylvania Dept. of Mines and Mineral Industries, gives the safety committee his wholehearted support in safety matters, even in between his frequent official inspections.

Minutes of the meetings, which promote necessary follow-through in clearing up hazards, are recorded by Samuel Bird Jr., company clerk and secretary of the safety committee.

The agenda usually consists of a reading of the minutes of the previous meeting to insure that all questionable situations have been cleared up. Accidents which may have occurred since the last meeting are discussed in detail with the aim of pinpointing causes and suggesting remedies that will prevent recurrences. The mine inspectors take the opportunity to point out shortcomings or hazards that have been turned up in inspections. The most immediately concerned supervisor then takes responsibility for correcting the matter as soon as possible.

One of the great advantages of these meetings is that the proceedings and suggestions for improving safety are immediately carried into the mine to inform and instruct the workmen and to gain their active support.



# you can have an

## ...with Jeffrey

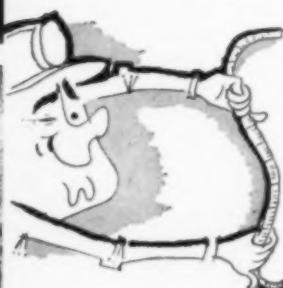
Alternating current power, with its many operating advantages, can now be employed throughout the electrified mine. All Jeffrey machinery, from cutters at the working face to the main belt carrying coal above ground, can be powered by AC as well as DC.



**Universal Cutters** Head and cutter bar can be rotated 360° in either direction for any kind of cut, any place in the seam—a 30-foot horizontal cut or a shearing cut 5' 5" either side of center.



**Roof Drills** For roof bolting to give you increased safety. 140 bolts per shift with the 56 RDR machines . . . some shifts averaging 190 or more 4-foot bolts.



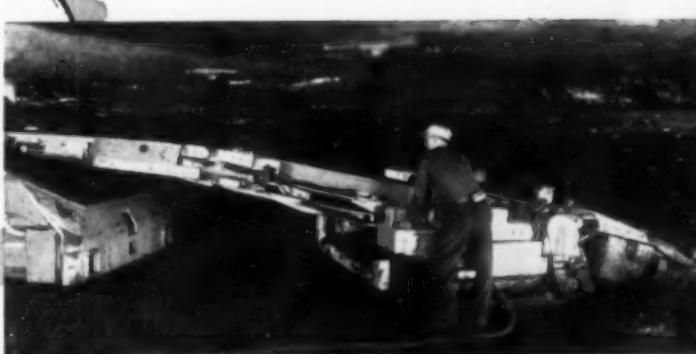
**Colmols** For low, medium or high seams, Jeffrey Colmols offer the ultimate in mechanized mining. Coal is broken from the face, not ripped or ground off. You get better overall screen consist, greater speed and efficiency. Withstands the most severe operating conditions.

# all-AC-powered mine equipment

Production goes up with Jeffrey machinery in your mine. Maintenance is low. The reason... 80 years of world-wide experience applied to the development of mining and materials-handling equipment.



**Loaders** Fast, easily maneuvered, highly productive; flexibility built into Jeffrey loaders lets them work most efficiently with other face equipment and the same mining cycle. Time-tested and proven dependable.



**Shuttle Cars** Payloads can be matched to your mining height: 4.6 tons to 9.2 tons. Jeffrey shuttle cars are highly maneuverable and fast moving; acceleration is smooth and automatic. Loading and unloading are similarly fast.



Let a Jeffrey engineer show you how to reduce costs with Jeffrey mining machinery and handling equipment. Call our nearest office. The Jeffrey Manufacturing Company, 912 North Fourth Street, Columbus 16, Ohio.

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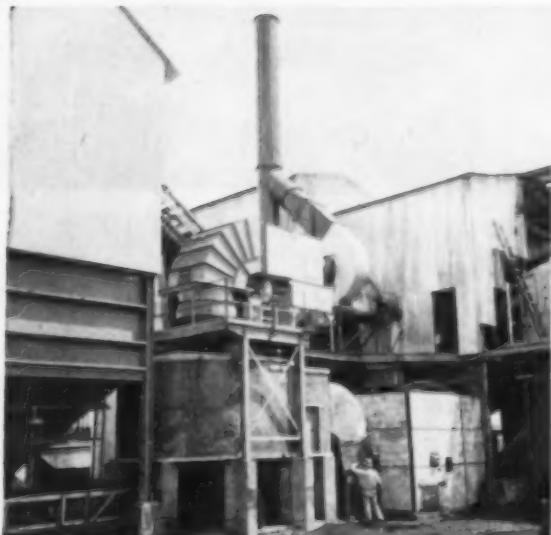
**JEFFREY**



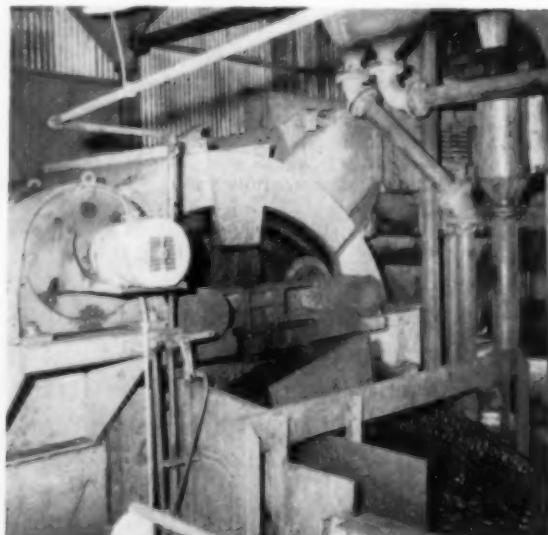
**KNIGHT IDEAL PREPARATION CENTER** includes original tipple at the right. Left is the prescription blending plant with the new drying plant between it and the new washery, rear. A new distributing conveyor handles loading to track or truck.

## Improved Preparation Solidifies

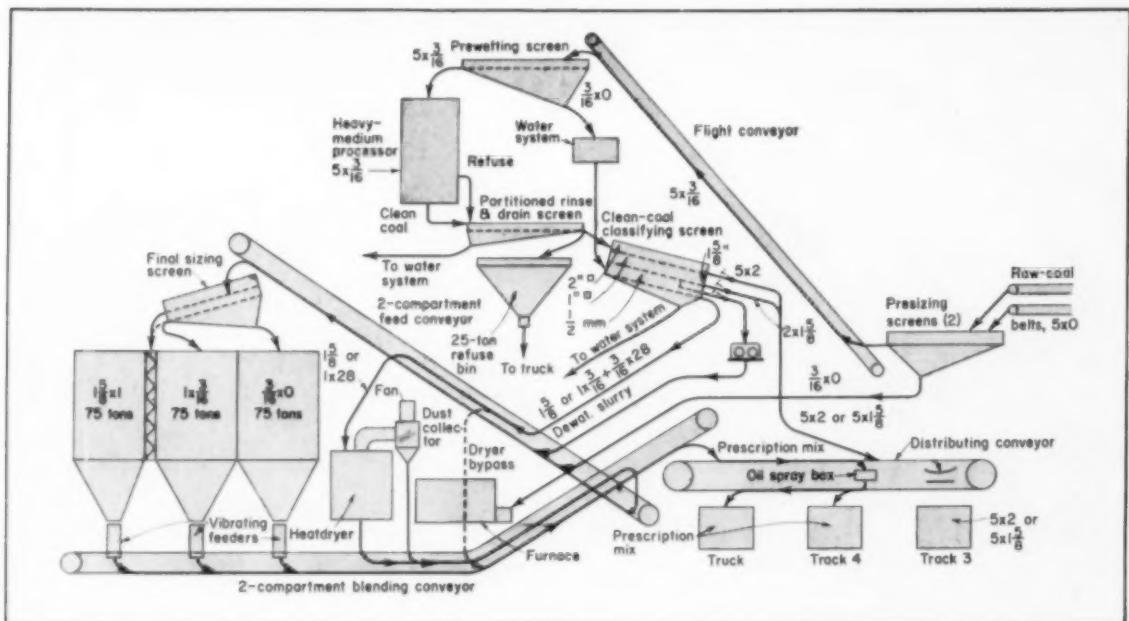
A better product results from the addition of heavy-media cleaner, new-type heat dryer and prescription blending units at Wellington, Utah, plant of Knight Ideal Coal Co.



**NEW HEAT DRYER** and auxiliaries reduces 1x0 surface moisture to 2 to 3%. Dried coal is finally sized in prescription plant.



**HEAVY-MEDIUM PROCESSOR**, preceded by prewetting screen, insures low ash and uniform quality of the 5x3/16-in.

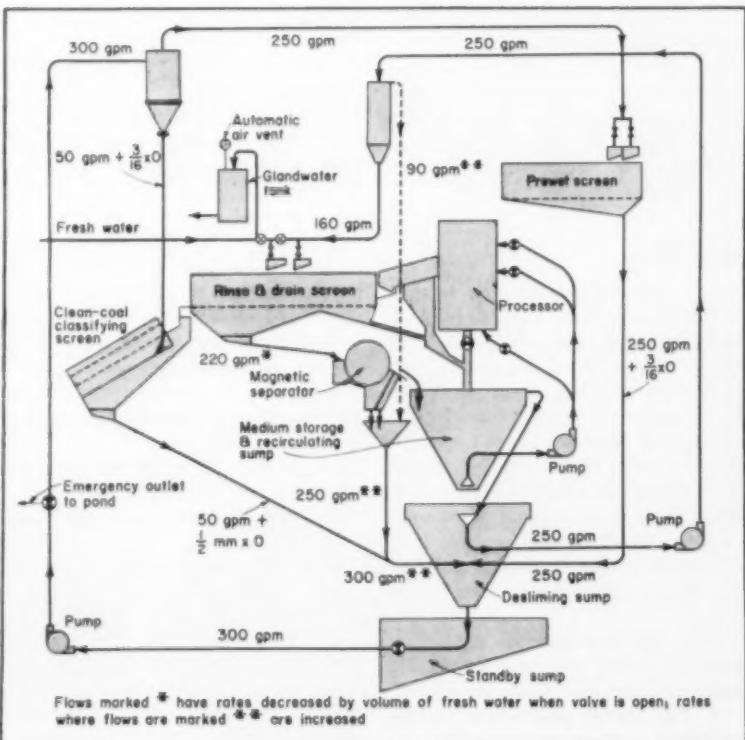


COAL FLOW, washing, drying and prescription blending addition to the Knight Ideal preparation center. Coal is received from two different mines and the plant facilities include ground storage of lump in summer for pickup and shipment in winter.

## Knight Ideal Market Position

ENHANCEMENT of a market position built up over more than 10 yr of efficient mining was the major objective of the Knight Ideal Coal Co. in installing a new washing, drying and prescription-blending plant at its Wellington, Utah, preparation center. Using a heavy-medium processor for cleaning, a new-type heat unit for drying, and adjustable-speed feeders for prescription blending, the new facilities permit shipping an accurately screened and precisely blended product averaging three percentage points lower in ash. Coal from the plant is marketed all over the West and also goes across the Pacific to Japan and Korea.

The Knight Ideal preparation center handles coal from two properties—Knight Idea No. 1, Knight Idea No. 2 at Dugout. The coal, considered moderately difficult to clean because of considerable near-gravity material, is brought in by truck from storage pockets at the mines. Normally it is discharged directly into a hopper feeding the main raw-coal conveyor, but provision also is made for ground storage and reclamation by a Hough Payloader.



WATER CIRCUITS, Knight Ideal washing addition.



START OF THE WASHING, CLEANING AND DRYING PROCESS is twin presizing screens which remove 3/16x0.



CLEAN-COAL CLASSIFIER separates washed coal into four sizes, two of which can be dried before loading.

The new cleaning, drying and sizing addition was designed by the Nelson L. Davis Co., which also provided the heavy-medium processor and the heat dryer. Handling 5x0 or 6x0, the new addition, to the north of and tied in with the original screening, crushing and picking tipple, has a raw-feed capacity of 150 tph. Steel for the plant was fabricated by the Empire Steel Co., and erection was handled by the Knight Ideal operating organization, headed by C. Arthur Carlson, manager, with W. J. Nevenner, outside superintendent, in direct charge.

#### Coal Flow

Raw coal from the dump hopper at Knight Ideal is elevated by belt to the shaking screen in the original tipple, where it is separated into lump, egg and 5x0 or 6x0—normally the former. The egg can be loaded or crushed, while the lump, for which there is an excellent market during the winter season is either shipped or, when there is no demand, as in summer, is stored on the ground. It is reclaimed by the Payloader and sent through the plant again before shipping.

The coal flow and the equipment involved in the new washing, drying and sizing additions are as follows:

1. Two 4x8-ft single-deck Symons presizing screens receiving 5x0 raw coal from the original plant (natural

5x0 plus crushed egg), and removing 3/16x0, which goes directly to the prescription screening and blending plant.

2. One 4x12-ft Low-Head prewet screen, receiving 5x $\frac{3}{16}$  via flight conveyor from the presizing screens and again screening at  $\frac{3}{16}$  for further removal of  $\frac{3}{16}$ x0 material—in this instance to the water system.

3. Neldco Size 105 H-M processor, cleaning 5x $\frac{3}{16}$ .

4. One 6x10-ft partitioned Low-Head rinse and drain screen. Refuse from this screen drops into a 25-ton bin directly under the screen for truck disposal.

5. One 4x8-ft Style S Ripl-Flo clean-coal classifying screen with 2-in-square screen on top deck, 1-in on upper end of second deck and 1 $\frac{1}{2}$ -in on lower end; and  $\frac{1}{2}$ -mm wedge wire on bottom deck over collecting pan. This screen also receives  $\frac{3}{16}$ x0 slurry from the prewet screen, and thus the possible products are:

5x2 and 2x1 $\frac{1}{2}$  to distributing conveyor for loading, or to crusher.

1 $\frac{1}{2}$ x $\frac{1}{2}$  mm or 1x $\frac{1}{2}$  mm, plus  $\frac{3}{16}$ x0 slurry, to dryer.

6. Clean-coal crusher—Gundlach 30x30 double roll—which can receive any or all coal from 1 in up and crush to 1 $\frac{1}{2}$  or 1 in. The crushed product discharges to one compartment of a 2-compartment conveyor feeding the prescription sizing and blending plant.

7. Prescription sizing and blending

plant, consisting of a 6x16-ft double-deck Ripl-Flo screen, three 75-ton steel bins, three Syntron vibrating feeders and a blending conveyor. With 1-in-square top deck and  $\frac{3}{16}$ -in square bottom deck, the screen produces 1 $\frac{1}{2}$ x1, 1x $\frac{3}{16}$  and  $\frac{3}{16}$ x0. These flow into their respective bins and are withdrawn as desired by the feeders. One, two or all three sizes can be withdrawn at any desired rate to make mixtures of any desired consistency.

8. Heat-drying plant for 1x0, consisting of a Neldco heat dryer, Bigelow-Liptak furnace fired with  $\frac{3}{16}$ x0 by Iron Fireman spreader stoker, American Air Filter exhaust gas fan and Amerclone dust collector. Coal brought in one compartment of the prescription-plant feed conveyor is discharged to the dryer through a gate. If drying is not on the schedule, the wet 1x0 can be bypassed to the blending conveyor. After drying, the coal, and the dust from the collector, go into one compartment of the blending conveyor, which in turn feeds to the 1 $\frac{1}{2}$ x0 compartment of the prescription-plant feed conveyor. Thus the dried coal is returned to the prescription plant for final sizing and binning.

9. Distributing conveyor receiving coal from the clean-coal classifying screen and the prescription plant. The 5x2 or 5x1 $\frac{1}{2}$  size is loaded on one track and the prescription mix on a second track or into trucks. The distributing conveyor is equipped with



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**ROYAL BLUE WIRE ROPE.** This, and its exceptional resistance to abrasion, shock and corrosion attack, make Royal Blue the strongest and safest wire rope you've ever used. On any comparative cost basis, nothing matches it as an instrument for transmitting power. For details on the real meaning of long service life, contact your nearby Roebling Distributor, or write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

**ROEBLING**

Branch Offices in Principal Cities  
Subsidiary of The Colorado Fuel and Iron Corporation





DOUBLE-DECK VIBRATOR provides 1 5/8x1, 1x7/16 and 3/16x0 coal for prescription blends dropped directly into bins.



ADJUSTABLE-RATE VIBRATING FEEDERS permit shipment of prescription mixes to Knight Ideal customers.



PLANT PERSONALITIES—W. J. Nevenner (left), Knight Ideal outside superintendent; right, Phillip Keith and F. K. Johnson, Nelson L. Davis Co.



a spray box between the strands for oil treatment of the prescription mix, while the 5x2 or 5x1% is treated on the end of the boom.

### The Heat-Drying Unit

The Neldco heat-drying unit is a new design. Diameter is 10 ft. It includes a preheating chamber for raising the temperature of the surface moisture of the feed coal to approximately boiling point before discharging it in a thin stream over the edges of two 10-ft revolving feeder platens. Coal is moved out from the center in spiral fashion by curved spring-steel blades.

The drying chamber consists of five

tiers of circumferential tuyere sections of heat-resisting cast iron mounted in slotted pockets provided by eight equally spaced cast-iron pedestals. This chamber is enclosed in ceramic insulation. Heat from the furnace is sucked by the exhaust fan into the space between the circular wall and the tuyeres in tangential fashion. Thus, the coal falls through a swirling vortex of hot gases and the design aim is equal heat distribution to all quadrants of the drying chamber, with the hottest gas at the top where the wettest coal is and the coolest at the bottom where most of the moisture has been removed.

The vapor-laden exhaust gases are withdrawn by suction through a Size

24 Design No. 2 Amerclone with 7 1/2-hp secondary exhauster and 1/4-hp double 12-in rotary dust valve. The unit has a capacity of 25,000 cfm at the inlet with a gas temperature of 300 F. The exhaust fan (American Air Filter) is rated at 28,000 cfm, 10-in water gage, 300 F inlet temperature, at 930 rpm. It is driven by a 75-hp motor.

The exhaust-gas duct includes a revolving portion of 1/4-in low-carbon steel 5 ft in diameter. It turns at approximately 2 rpm and is driven through a 5-hp Falk vertical reducer. A tongue-and-trough-type labyrinth seal is provided at the connection to the stationary duct leading to the dust collector.

Drying gases are provided by a Bigelow-Liptak furnace designed for a heat release of 10 million Btu with an average exit gas temperature of 700 F. It is fired by a Size 12 Iron Fireman pneumatic spreader stoker.

A complete installation of Foxboro thermocouples and recording instruments is provided. If the temperature in the exhaust duct drops to 280 F, the cooling-air damper is closed to raise the temperature of the gases from the furnace mixing chamber. At 300 F, the dampers are opened to reduce the temperature of the gases entering the dryer.

Total time the coal is retained is approximately 80 sec, of which 60 sec is in the preheating zone or chamber. The automatic controls pro-

vide for admitting cool outside air to the lowest zone in the drying chamber in event it is necessary to cool the dried coal. The short total exposure time is designed to prevent overheating of the larger particles of coal after drying.

### The Water Circuit

Closed-circuit operation was the goal in the design of the water system for the Knight Ideal plant. Fresh water is obtained from a 45-ft-deep well and is introduced as necessary through the spill boxes over the rinse-and-drain screen. Normally, however, these boxes, as well as other boxes over the prewet screen, introduce clarified water from the top of a desliming tank and from a cyclone overflow.

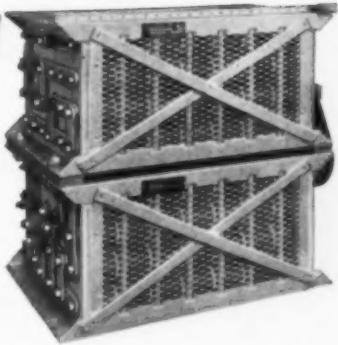
Part of the inflow to the desliming sump is derived from the prewet screen and carries coal up to  $\frac{3}{16}$ -in in size. The remainder comes from the lower section of the rinse-and-drain screen via the Stearns magnetic separator, and from the clean-coal classifying screen. Reclaimed magnetite goes into a medium storage and recirculation sump, which also receives medium from a fixed sieve and the upper section of the rinse-and-drain screen. Medium is recirculated to the processor by a 6-in Hazleton TS pump.

Deslimed water from the top of the desliming sump is recirculated to the spill boxes over the rinse-and-drain screen by a 4-in TS pump. The underflow from the desliming sump is pumped by another 4-in TS pump to a 12-in Dorrclose cyclone. Top size of the solids in this underflow is  $\frac{3}{16}$  in. The cyclone overflow goes to the spill boxes over the prewet screen, while the underflow goes to the lower deck of the clean-coal classifying screen.

Electrical equipment for the new plant includes General Electric motors with Westinghouse control center. Falk reducers and chains are employed on conveyor drives, with V-belts on pumps. A new transformer station was added to provide power. Heat for the new installation will be provided by ducts from the dryer furnace.

Field engineer for the Nelson L. Davis Co. was Frank K. Johnson. Special attention to the construction and starting of the dryer was given by James T. Grogan and Phillip Keith.

## What do YOU need in a Locomotive Resistor?



### GUYAN offers you these advantages:

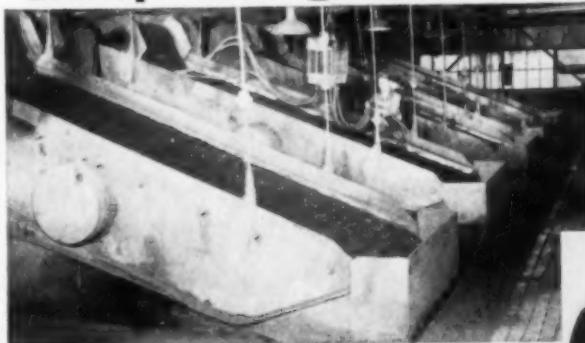
**P**ROTECTION—for your motor and controllers, LONG SERVICE LIFE—without warping and buckling; SMOOTH STARTING—without dangerous jumps between points; HARD SERVICE REQUIREMENTS—engineered and designed for your locomotive and mine conditions; ECONOMICAL PRICE—low first cost and maintenance freedom.

GUYAN Locomotive Resistors are recognized in the mining industry for their ruggedness and dependability. They are built to withstand rough usage in locomotives and moving machinery where excessive vibration and shock make the more fragile grid types undesirable. Write for details.

**GUYAN MACHINERY CO.**  
LOGAN, W. VA.

**Guyan**  
RESISTORS

### How Link-Belt electrically heated CA vibrating screens achieve sharp sizing without blinding



SPRING CONTROLLED centrifugal weight type counterweight assembly eliminates excessive resonant motion (bouncing) of the screen while starting and stopping.



FOUR LINK-BELT CA VIBRATING SCREENS size coal at preparation plant of Kentucky mine. Electric screen heater on second unit prevents blinding of cloth when handling fine coal.

The smooth, powerful Concentric Action of Link-Belt CA vibrating screens assures fast, accurate sizing of all kinds of coal. And the Link-Belt electric screen heater prevents plugging and blinding of screen cloth . . . provides top performance when handling fine coal and other hard to screen materials.

One-deck, two-deck and three-deck CA screens are available in sizes from 4 to 6 feet wide by 8 to 14 feet long for a wide range of coal sizes. For additional information, call your nearest Link-Belt office. Or write for Book 2554.

**LINK-BELT**  
VIBRATING SCREENS

LINK-BELT COMPANY: Chicago 9, Birmingham 3, Cleveland 20, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 2, Pittsburgh 13, Seattle 4, St. Louis 1. To Serve Industry There are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, São Paulo; Canada, Scarborough (Toronto 13); South Africa, Springs. Representatives Throughout the World. 14,677

**Coal Chief scoops and dumps  
100 tons a minute!**





Four Boom Support Strands, each 3 $\frac{1}{8}$ " dia., support the huge boom which towers 160 feet above the ground. These Tiger Brand cables are designed for long service life.

USS American Tiger Brand Hoist Rope. Two of these 2 $\frac{5}{8}$ " dia. shovel hoist ropes supply the guts to lift the heaviest loads.



## Rigged with American Tiger Brand Wire Rope

Here's the latest of the big diggers, the Coal Chief, built by Marion Power Shovel Company. It can scoop up 70 cubic yards at a bite, swing it approximately the length of a football field and dump it in piles more than 96 feet high. It makes the round trip in less than 60 seconds.

This strip mining operation is a joint venture between Simco Peabody Company and Columbus & Southern Power, Columbus, Ohio. All the coal produced will be furnished to the power company . . . about 8,000 tons a day.

The new shovel, like its two predecessors, is rigged throughout with USS\* American Tiger Brand Wire Rope. The tremendous power of the

shovel is handled by two hoist ropes 2 $\frac{5}{8}$ " diameter, and the gigantic boom is supported by four lengths each 105 $\frac{1}{2}$  feet long, of 3 $\frac{1}{8}$ " diameter galvanized boom support strand. Each strand has a catalog strength of 768 tons, for a total of 3,072 tons.

Your equipment may not need such large wire rope, but the fact that all applications on this huge shovel are handled by standard USS American Tiger Brand\* constructions emphasizes the quality of the engineering that goes into the complete line of Tiger Brand Wire Rope. For more information, write American Steel & Wire, Rockefeller Building, Cleveland 13, Ohio.

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6,000 tons of overburden per hour can be stripped by this new 70-cubic-yard Marion shovel built for Simco Peabody Company and Columbus & Southern Power.

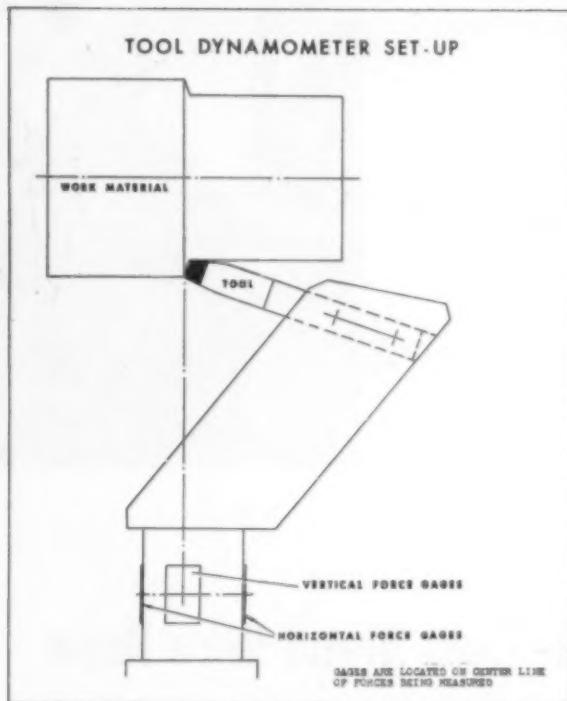


Fig. 1

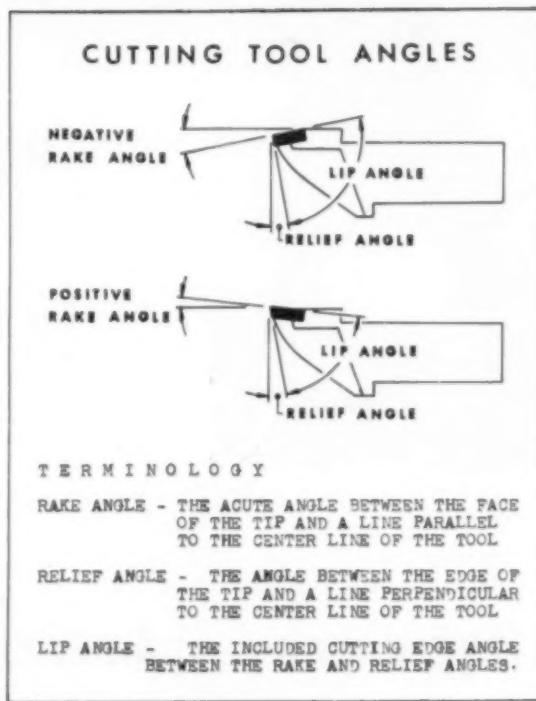


Fig. 2

## New Bit Designs Contribute to Lower-Cost Coal Cutting

Extensive tests indicate that a negative rake angle on carbide-tipped cutter bits will reduce tool breakage without increasing the amount of fines. Proper relief angle eliminates bit rubbing which consumes power needlessly.

By J. C. Leighton, Carbide Products Design Engineer, Metallurgical Products Dept., General Electric Co., Detroit, Mich.

RISING operating expenses and the problems of thinner, leaner seams make it increasingly urgent to explore all possibilities for increasing the efficiency of coal-mining operations. Improved cutter-bit design will reduce cutting costs and increase production. While this may appear to be a minor factor when compared with overall investment or production costs, the influence of good design is cumulative and substantial once it has been accepted as part of daily routine. Savings, no matter how small, are important in any industry since small savings become significant when they are made shift after shift.

In our investigation of mining bits we established the

most efficient design by evaluating known and measurable forces. Consequently, we recommend optimum relief and rake angles for carbide mining tools and conclude that the adoption of this new concept of cutter-tip design will materially reduce cutting costs and increase production throughout the coal industry.

### Laboratory and Field Tests

Our laboratory tests furnished basic information about cutting characteristics of various machine bit designs. A tool dynamometer (Fig. 1) measured and recorded the horizontal and vertical forces involved while machining coal and coal impurities. Many combinations of relief angles, rake angles and cutting feeds were tested in this manner. Utilizing these data, field tests were conducted which in-

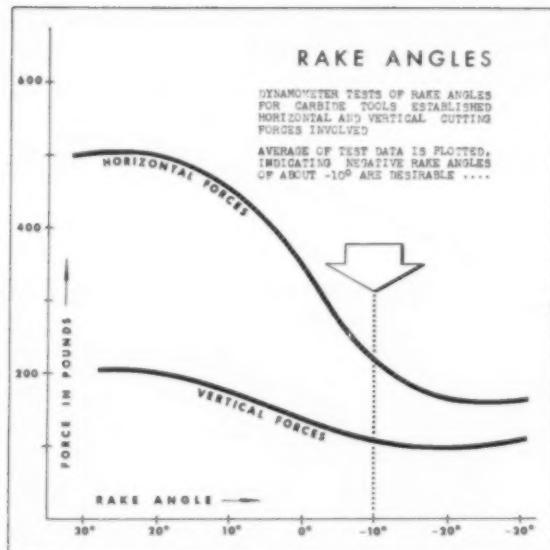


Fig. 3

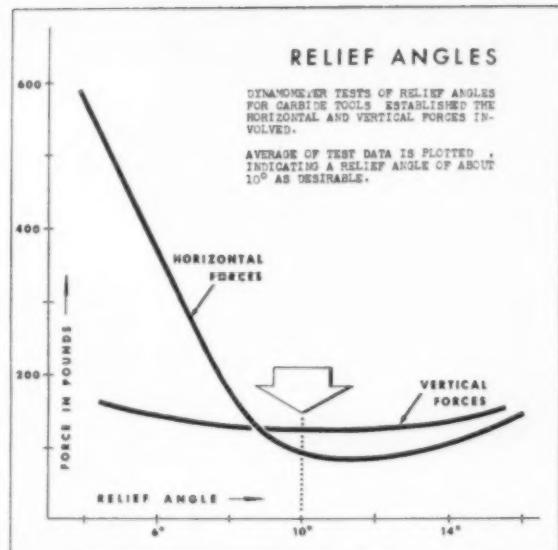


Fig. 4

volved design, fabrication and testing of more than 2,300 tools.

Each group of tools was continually observed while in production on a universal cutting machine and a ripper-head continuous miner. Tool conditions were noted periodically during each work shift. Current, voltage, seam conditions and production time were recorded during full 8-hr shifts.

These tests indicate that a more efficient and more economical coal-cutting tool should incorporate a rake angle of minus 10 deg and a relief angle of 10 deg, as shown in Figs. 2, 3 and 4. "Negative rake" tools have larger lip angles with greater cross-sectional areas of carbide. This provides more edge support and forestalls tip wear and the resulting buildup of cutting pressures. The result is reduced tip breakage and longer tool life (Fig. 5).

### Reducing Tip Breakage

Tip breakage is the major factor causing destruction of cemented-carbide mining tools. Tips break or crack when the concentration of cutting forces at the cutting edge exceeds the strength of the tip material.

A carbide tip of the recommended design eliminates the small acute lip angle which is present on high positive rake tools and provides greatly reduced tool breakage. This may be explained by the fact that the recommended rake angle causes the carbide tip to be in compression during cutting, thereby using the very high compressive strength of the tungsten carbide.

Breakage data for various tool designs show significantly less breakage for tools with negative rake angles (Fig. 6).

### Longer Tool Life

Due to the heterogeneous nature of coal impurities, the cutting tool is subject to rapid changes of pressure from compression to tension, leading to breakdown of the

### Benefits of Bit-Design Changes

A negative 10-deg rake angle and a 10-deg relief angle on carbide-tipped cutting bits will . . .

- lower overall cutting cost
- greatly reduce tool breakage
- not require more electrical energy per ton
- not increase the amount of fine coal
- keep tools sharp longer
- decrease cutting time
- reduce downtime through fewer tool changes
- permit use of harder grades of carbide.

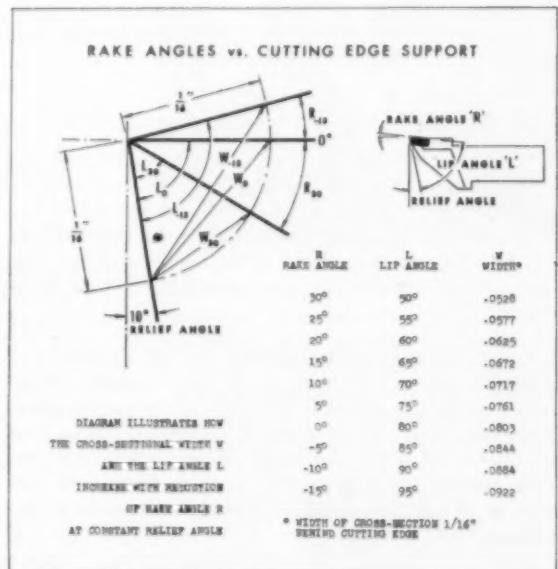


Fig. 5

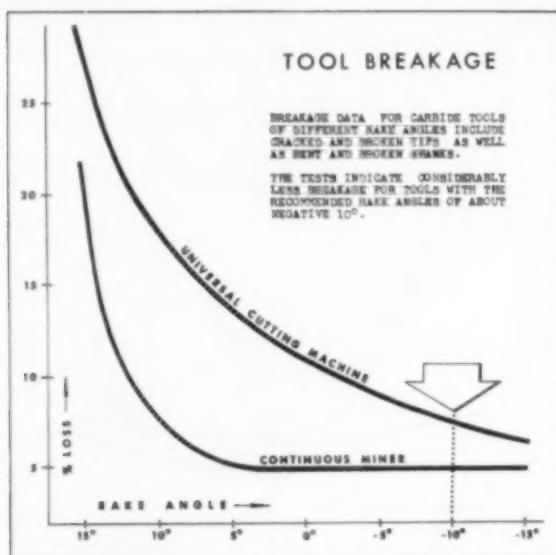


Fig. 6

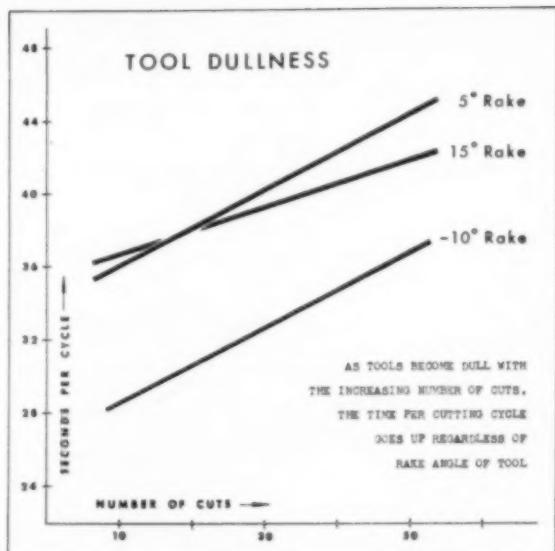


Fig. 7

carbide cutting edge. When negative rakes are employed tool failure is substantially reduced because of the stronger cutting edge. The recommended relief angle of 10 deg will minimize rubbing. This is desirable since rubbing action, by increasing cutting pressures, hinders penetration and actually reduces the depth of cut.

The negative rake angle in conjunction with the correct relief angle improves tool life substantially. With the elimination of the small lip angle it may be possible to utilize harder grades of carbide and to further increase tool life.

On the matter of size consist, high-speed motion pictures made during the tests show that tools with negative rakes cause the breaking out of large pieces of coal ahead of the tool, thereby reducing the amount of fine coal. Screen analyses made during the field tests confirm this result.

### Tool Dullness

Tool dullness, or tip wear, results from minute chipping or abrasion. The rate and amount of such wear depend primarily upon the material being cut. The abrasive action of any material on any tip results in tool wear and dullness.

Following are the effects of tool dullness on cutting time, ampere requirements and consumption of electrical energy.

Continuous time studies establish the fact that the time needed for the cutting cycle of all tools, regardless of design, increases as the tools lose their sharp cutting edges and become dull (Fig. 7). This is understandable because tip wear is related to the length of time a tool is in use. Time needed for each cutting cycle increases with the number of cuts, since cutting action decreases as a tool becomes dull.

In constant-thrust-type machines, such as universal cutting machines and continuous miners, total amperage re-

quirements decrease as tools become dull. Here the thrust is maintained at a constant value by hydraulic motors. As tools become dull, the depth of cut is reduced. Consequently motor torque and amperage are reduced, as compared with sharp-bit cutting.

However, because of the constant thrust in these machines, friction resulting from the rubbing action of the tools will increase the current demand somewhat. In other words, with zero depth of cut and constant thrust the current demand would not be zero, since some current is used in the rubbing action. The recommended 10-deg relief angle minimizes rubbing, as previously mentioned in this article.

Rubbing increases with tool dullness, and current requirements increase accordingly. This somewhat offsets the decrease due to reduced penetration, but the net result is still decreased amperage as tools become dull.

In the constant-feed type shortwall cutting machine, however, the current requirements increase with tool dullness.

As tools become dull, constant-thrust machines need less amperage but take more time per cutting cycle. With sharp tools in the machine, amperage is high but cutting time is relatively short. Actually, the product of time and current remains constant for a given machine, regardless of tool condition or geometry.

This means that amperage alone provides no indication of the efficiency of your mining operation. The electrical energy for which you pay is expressed in watt-hours or kilowatt-hours, not in amperes. Energy is a product of voltage, amperage and time.

Assuming constant operating voltage, energy requirements and electrical costs remain constant, if the product of amperage and time remains unchanged. This is the case in constant-thrust machines. Therefore, the electrical energy necessary to remove a ton of coal is constant, if friction is disregarded. Tool dullness has no effect on the expenditure of electrical energy per ton of coal mined.

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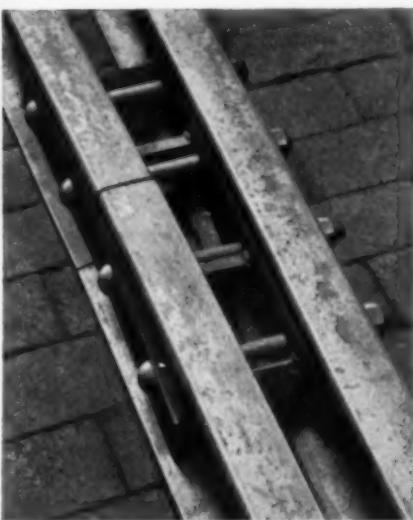
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### **BETHLEHEM STEEL**



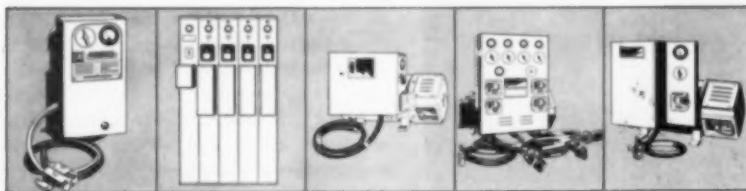
**SWITCH STANDS**, such as the Model 1222, are a Bethlehem specialty. The 1222 is shown here in use with 85-lb rail. Notice how low and compact it is—overall height is only 4 1/4 inches! The only moving parts are lever, crank and sliding block—no maintenance worries there!



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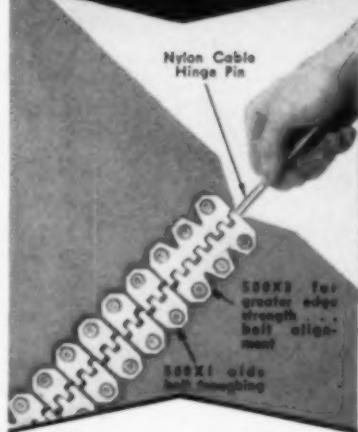
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**HIGH-CAPACITY, CRAWLER-MOUNTED DRAGLINE** and "down-the-hole" drill team up in tackling thick overburden in second-cut stripping of a dipping anthracite vein. Bucket capacity of the electric-powered dragline is 8 cu yd.

## Percussion Unit Drills Hard Rock

Overburden preparation for anthracite stripping is a job for "down-the-hole" drill using carbide-tipped 6½-in bit. Electric-powered 6- and 8-yd draglines remove broken rock from dipping vein.



**SELF-CONTAINED DRILL** makes 6½-in blastholes in depths varying from 15 ft to 120 ft. Operator's cab is out front for better visibility.

THE NEED TO DIG DEEPER nowadays in anthracite stripping is clearly evident in the new equipment seen in the region. Dragline buckets are bigger, booms are longer and of course the main machinery bases which back up these bigger front ends are beefed up accordingly. High-capacity overburden drills, rotary and percussion, are taking over the job formerly done by churn drills. The object is to provide an unfailing supply of broken rock ahead of the big stripping machines, and to do this in a manner most economical of labor and numbers of machines.

This swing to bigger machines results from the fact that most of the "first-cut" coal already has been recovered in times past by other operators using smaller equipment. Recovering the second and third cuts in pitching veins requires stripping units that can hoist fast and spoil at long range, and drills that can set the pace for the entire operation.

A second-cut situation faced the engineers and officials of Sullivan Trail Coal Co. at their new opening at Park Place, Pa., near Mahanoy City. Their answer is to strip with a 6-yd Lima 2400 dragline and a new electric-powered 8-yd Marion

181M. The drilling is done by an Ingersoll-Rand Drillmaster, an air-powered machine using a "down-the-hole" drill. Working three shifts, the drill provides broken rock for three-shift operation of both draglines.

At the Park Place job, Sullivan Trail is stripping north and south dips of the Buck Mountain vein which runs about 25 ft in thickness here. Dip ranges from 40 to 50 deg. The area has been deep mined, leaving the pillars to be recovered by the equipment now on the job.

The new dragline is one of the largest on crawlers. It is the electric-powered counterpart of the Marion 183M, a diesel-powered machine described in *Coal Age*, Sept. 1957, p 74. The boom is 120 ft long, making it possible to cast spoil on top of that which was left in the first-cut voids. The machine receives power at 4,000 V through a Type SHD trailing cable. The photos were taken as the 181M was engaged in opening up the second cut. It is planned to remove a third cut, later on, to a total overburden depth of 120 ft.

Both draglines work from benches prepared by a bulldozer. The soft material is pushed past the limits of the third cut wherever possible. When this cannot be done the dozer pushes the material into the pit for removal by the dragline.

The Drillmaster also operates on this level area prepared by the bulldozer. The drill is a self-contained unit having a diesel engine for driving a 600-cfm rotary compressor and powering the crawlers. The down-the-hole hammer is an I-R Depth-Master equipped with a 6½-in Carset bit. Tom Long, foreman of the Park Place job, points out that the rock is very hard and that the drill crews have had more success with percussion drilling than with rotary in this type of ground.

Drill rods are 25 ft long, and hole depth varies from 15 to 120 ft, as governed by the pitch of the vein. The holes are drilled in a 15x15-ft pattern, with the usual overburden shot consisting of 15 holes. The shooting is done against the open end with MS delays between rows. Commercial-grade ammonium nitrate with fuel oil is charged into the holes at a rate of one 80-lb bag per 7 ft



DOWN-THE-HOLE DRILL (arrow) is equipped with carbide-tipped bit for efficient drilling in hard rock.



WATER CHECK (arrow) prevents entry of water or dirt into hammer if compressed-air supply is interrupted.



6-YD DRAGLINE works opposite end of pit aided by bulldozer which prepares level benches for excavators and drill.

of 6½-in hole. The average hole takes about 240 lb of this main charge and a 25-lb primer. The detonator is Primacord.

One of the difficulties encountered in drilling is the presence of water in the holes. This condition is particularly critical in down-the-hole drilling because an influx of water and dirt into the hammer would shut down the drilling operation while the hammer was disassembled and cleaned. The problem is solved at the Sullivan Trail operation by the use of a water check valve between two of the drill rods.

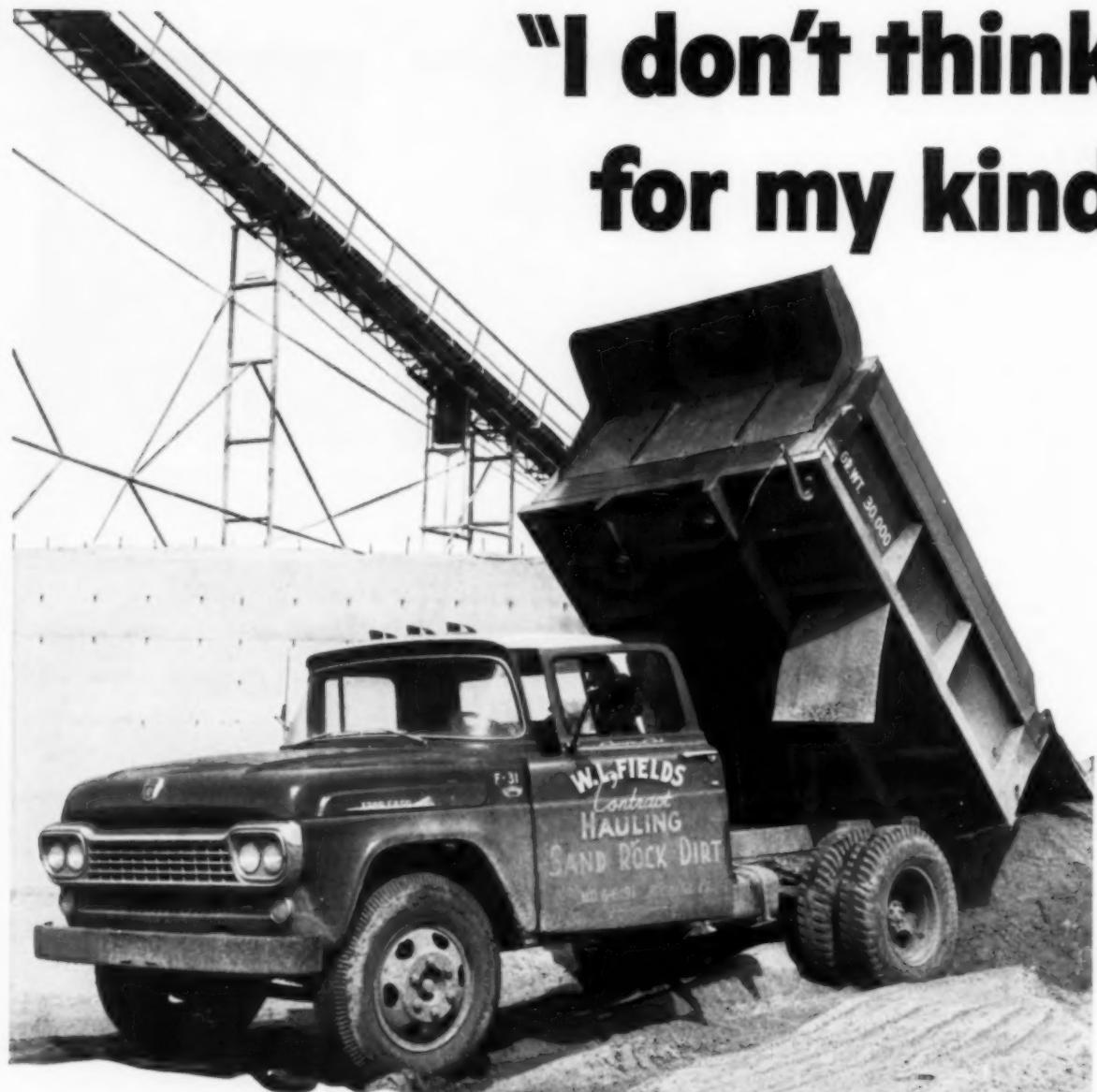
The water check permits the compressed air to flow toward the hammer but prevents backflow if the air supply is interrupted or shut off for any reason. This sealing action

maintains a charge of high-pressure air within the hammer which prevents the entry of water. The check consists of a rubber sleeve containing a steel cylinder. The rubber collapses onto the steel to seal the air passage.

The crew includes a drill operator and a helper. The helper dresses the carbide inserts on used bits right on the job with an air-powered grinding wheel operated from a take-off on the big drill.

Sullivan Trail Coal Co. is one of a group of producers headed by Louis Pagnotti, president, with headquarters at West Pittston, Pa. Sullivan Trail machines are active in western Pennsylvania and West Virginia in stripping. The property at Park Place is about 2,000 ft long on the strike of the Buck Mountain vein.

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# Dry Pipelining Of Coal

Ability to reduce coal to minus 5 microns economically promises dry pipelining over land at costs as low as 1/2¢ per ton-mile.

By Theodore Nagel  
Mechanical-Engineering Consultant, New York

AIR TRANSPORT of coal is an old technique. Up to now, however, it has been limited in distance by several factors, one being the difficulty and cost of getting the coal fine enough so that it could be handled with approximately the same ease as liquids or liquid-solids mixtures. A solution to this problem of reducing the coal to an ultrafine state would, of course, bring us much closer to the day when coal could be blown through long-distance pipelines to electric-utility or other consumers using pulverized-coal firing systems.

Dry pipelining of coal would have obvious advantages. First, the problem of dewatering at the receiving end would be eliminated and the coal would be delivered directly to the burners from the line, except for a minimum of storage to meet peaks. Second, air is substituted for water as the carrying medium with a major saving in power.

## Ultrafine Sizing

The big thing that would make long-distance air transport of coal possible is, as previously noted, getting it fine enough so that the limitations of conventional air transport through pipes would not apply. Coal is currently ground to minus 200 mesh (74 microns) for pulverized-coal firing. Even with this top size it is dif-

ficult to move it more than a limited distance without boosting, which would be out of the question with a long-distance overland line. But if reduced to less than 5 microns, the difficulties would be eliminated. One particle of 74 microns would produce 3,240 particles with a top size of 5 microns, and the total surface area would be increased 219 times. The particles should be easy to entrain and should stay in a low-pressure air stream for distances of up to 50 mi or more before boosting would be necessary.

One process for such micronizing has been developed by the author (Process Patent No. 2,714,489 and patent application). In this "counterflowing solids impact shattering system" the material is entrained in opposed air streams and thus is micronized by impact without moving parts. Air or steam at approximately 100 psi can be used in the shattering process.

Since coal 5 microns or less in size approaches the gaseous state it results in higher-temperature radiant heat with consequent increase in the evaporation rate and in pounds of steam per million Btu fired. And it should not be forgotten that the coal (except for surge storage) is delivered to the furnace with no intermediate storage or processing steps after it is micronized at the mine and fed into the pipeline.

## Pipeline Operation

Assuming a 10-in line 100 mi long and coal requirements of 225 tph for 6 hr of peak steaming and 150 tph for 18 hr of base-load operation, a pipeline setup might include two or three pumping or blowing stations, one at the mine and the others at strategic locations along the line. Other factors might line up as follows:

Size of coal processed at mine—minus 1/4 in.

Size of coal after processing—minus 5 microns.

Rated capacity of line—168 1/4 tph, of which 18 1/4 flows into a bunker for 18 hr per day and is withdrawn to add to the rated quantity during the 6 hr of peak steaming.

Air required—approximately 0.945 tph, or 412.5 cfm compared to, say, 168 1/4 tons of water for a 50:50 slurry mixture, by weight.

Line pressure—120 psig in and 5 psig out at boilers.

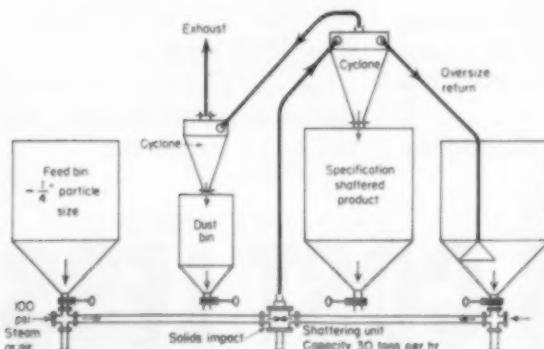
Total volume to pipeline—coal, 67.5 cfm; air, 412.5 cfm; total, 480 cfm at 120 psig.

Line velocity—218 fpm in to 790 fpm out.

Transit time—24 hr (4,050 tons in transit).

A 10-in 100-mi air-coal pipeline could provide a transportation cost of as low as 50¢ per ton at the power-plant burners, or 1/4¢ per ton-mile, compared to, say, \$3.25 per ton by rail plus an additional 62¢ per ton for unloading, handling and grinding to minus 200M. If the line cost was \$10 million and the interest on investment for 1 yr of construction and 3 yr of operation was \$1 million, the total of \$11 million could be amortized in 4 yr from the savings achieved in 3 yr of initial operation, after which the operating cost would be 50¢ per ton.

It must, of course, be recognized that additional research and engineering will be required to arrive at the final design of an air-coal pipeline. However, since the coal can now be reduced to the desired state of fineness (see "Comminuting Friable Solids," *Engineering and Mining Journal*, a McGraw-Hill publication, April, 1958) a big hurdle has been removed.



COAL MICRONIZING, the key to dry pipelining, is achieved by this "counterflowing solids impact shattering system."



After drilling 15 to 20 shoot-holes, the Tractair moves to the next job. "We save time and labor because the Le Roi unit doesn't need to be babied into position," says Green. "We drive the Tractair onto rocks, slopes, or loose ground and start drilling."

## Tractairs\* Save \$150 a Day at Blasting Site

**Le Roi tractor-compressor used to drill shoot-holes for blasting overburden**

**Easier and safer to handle on rough terrain than dozer-drawn compressors, superintendent says**

The V. N. Green Co., Brown's Branch, W. Va., saves \$50 per day at each site by using Le Roi Tractairs to drill shoot-holes for blasting surface rock at their strip mining operations. When all three Tractairs are used, as is generally the case, daily savings total \$150, reports John W. Green, job superintendent.

Previously-used wheel type compressors had to be moved around the site by a standby dozer. The 10 to

15 moves per day took two hours. The dozer lost the same amount of time, too, when its work was interrupted.

### Mobility Minimizes Delays

Green points out that now "the Tractair is driven directly to the drilling area, the hose is attached, and drilling starts at once." In addition, Tractair's easy maneuverability over the extremely rough terrain cuts previous relocation time by more than half, and eliminates the need for the dozer as well as the operator.

Because it's self-propelled, the Le Roi tractor-compressor is ideal for this type of work. When a job is done, the Tractair provides fast transportation for the operator, drill, and compressor to the next site. There's no need to wait for other equipment to make the move.

What's more, close-to-the-job air power shortens hose lines, substantially reduces hose damage, and eliminates power loss. The shorter lines and Tractair's 125 cfm output permit the use of two drills, when necessary.

### Performs Various Jobs

Bought originally for drilling shoot-holes, the Tractair can be used for other jobs, too. "We also use our Tractairs to break paving on road construction jobs where we do the resurfacing, to tamp backfill for drain pipes, and even to clean pavement by using a rotary brush attachment."

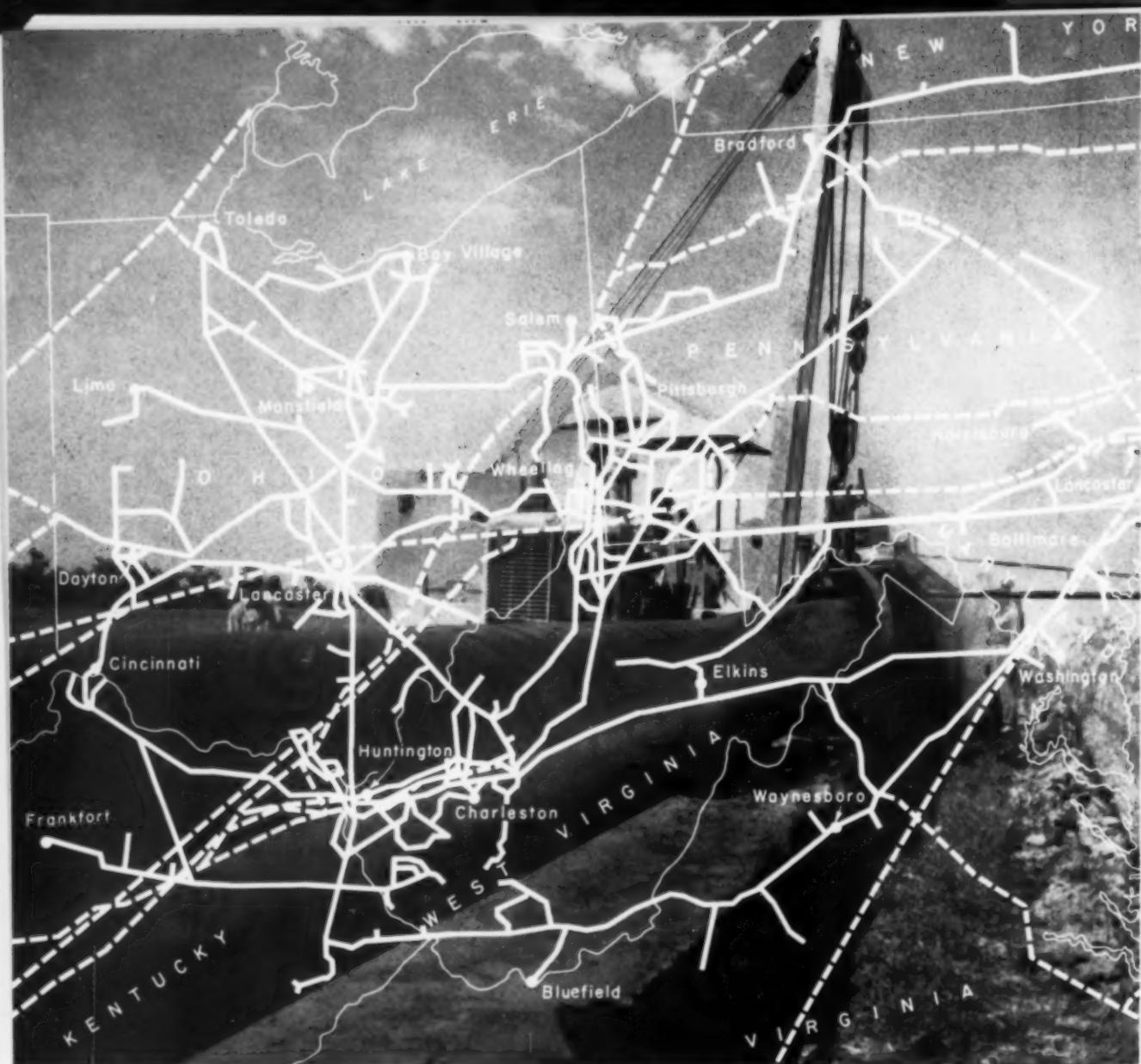
The self-propelled, multi-purpose Tractair can provide similar savings for you. And its ready adaptability to a wide range of attachments can help you reduce the cost of operations requiring costly, one-purpose equipment. Contact Le Roi today.

\*Tractair is the registered trademark for Le Roi's combination tractor-air compressor.



Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Newmatic air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.





**FACTS** Sprawling gas pipeline network blankets the heart of Appalachian coal regions. The natural geographic tie gives coal and gas a mutual stake in making synthetic pipeline gas a commercial reality. Vigorous planning by gas raises the . . .

## The Outlook for High Btu Gas

By Dr. Martin A. Elliott  
Director, Institute of Gas Technology

FOR COAL to be used in the production of high-Btu gas, a significant price differential in favor of coal must develop between the wholesale (or city-gate) price of gas and the wholesale price of coal. No attempt will be made to predict this relationship in the future, but cur-

rent trends point toward its development. The wellhead price of gas, for example, has increased steadily from about 5c per MCF in the middle 1930s to about 11c per MCF in 1956. Similarly, the average U. S. wholesale (or city-gate) price of natural gas increased from about 17c per million Btu in 1949 to about 28c in 1956.

Thus, the trend in gas costs has

been consistently upward for the past 20 yr. The upward trend has been due partly to inflation but increased demand and the higher cost of finding new supplies of gas have also contributed significantly. Furthermore, when it is realized that the price of wellhead gas ranges from 20-25c per MCF, with provision for escalation in some current long-range contracts, it is evident that the up-



**QUESTION** Is coal also preparing for this event?—The editors.

## From Coal

ward trend of gas prices will continue for some time.

The question of immediate interest is: "What will be the trend in the differential between gas and coal prices?" In recent years, this differential has been decreasing. For example, in the coal-consuming states, the price of gas for steam-electric plant fuel was 7.5c per million Btu less than the price of coal in 1951,



### About the Author . . .

MARTIN A. ELLIOTT was named director of the Institute of Gas Technology Feb. 1, 1956. Since John Hopkins gave him Bachelor (1930) and PhD (1933) degrees in gas engineering, he has had wide and distinguished experience. Among his previous posts: consultant to IGT's engineering staff; research professor, mechanical engineering, Illinois Tech; and chief, USBM, liquid fuels research. For 12 yr of USBM work, the Department of the Interior honored him in 1952 with its Distinguished Service Medal. Dr. Elliott spent 1950 studying synthetic-liquid-fuel processes and fuel-gas production in Europe. In 1954, he chairmanned the Gordon Research Conference on Coal. The IGT head has authored some 35 papers on fuel and gas technology and is a member of numerous technical societies.

## Coal-based Natural Gas When . . . Why . . . How

AN EXPERT looks at the economic and research status of high-Btu-gas-from-coal. Among his findings:

1. Coal will be used as a source of high-Btu gas when the wholesale (or city-gate) Btu price of natural gas exceeds the mine-Btu price of coal by an amount at least equal to the cost of making the synthetic product and transporting it to gas markets.

2. Wholesale gas prices in New England are now almost double the national average. Because of this and because supplies of coal are closer to New England than natural gas, base-load high-Btu gas from coal might become competitive there sooner than in other regions of the U. S. [Another possibility is the Middle Atlantic States where the wholesale price of gas is now about 40% above the national average.]

3. Regardless of price considerations, projected demand for and estimated ultimate reserves of natural gas show that high-Btu gas from coal may go commercial in the 1970s. However, future limits on deliverability (ability to dedicate a long-range supply for long-distance transmission) may advance the date to the late 1960s.

4. The major effort in synthetic natural gas production is on coal as a raw material since it is the most plentiful fossil fuel. Process development has reached the point where further progress depends largely on constructing a full scale demonstration plant. This is now vital to anticipate future commercial needs.

5. Research has concentrated on converting coal to high-Btu gas or

methane by (a) upgrading coal-derived synthesis gas and by (b) direct hydrogenation of coal pretreated to destroy its cooking properties. Technology is more advanced on upgrading but hydrogenation has advantages of lower oxygen requirement and higher methane yield. Finished gas costs by either method now range from 80c to \$1 per MCF.

6. Cheaper ways must be found to produce synthesis gas from coal since its present cost accounts for about 75% of total finished gas costs. Offering the greatest promise for reducing costs here is high-pressure gasification of coal in suspension with oxygen and steam. Also in the picture: a modified version of the fixed-bed Lurgi generator process. Based on noncoking coal, this process is now used commercially in Germany, South Africa and Australia.

7. Conventional processes are available for converting synthesis gas to methane. Needed, however, are: (a) catalysts more resistant to attrition or size degradation, and (b) better heat control and heat recovery techniques.

8. Production of methane by direct hydrogenation of pretreated coal has been demonstrated in a continuous operation. Present cost estimates by conventional methods are about the same as in the methanation of synthesis gas. But variations of conventional methods now under study may bring costs down substantially according to rough estimates.

**WORTH NOTING:** Possible roles for nuclear energy (p 124); two billion tons of coal for gas (p 125).

but only 4.7c less in 1956. Also, the average coal price has been relatively constant for the past several years, while gas prices have been increasing.

Comparison of U. S. averages is gross oversimplification because geographic factors have an important effect on fuel economics. For example, wholesale gas prices in New England are almost double the national average. Because of this and because supplies of coal are closer to New England than supplies of natural gas, base-load high-Btu gas from coal could become competitive there sooner than in other regions of the U. S. [Another possibility is the Middle Atlantic states where wholesale gas costs are about 40% higher than the national average.]

### Demand vs Reserves

If we disregard price considerations entirely, what will be the need for supplementing our supply of natural gas with high-Btu gas from coal?

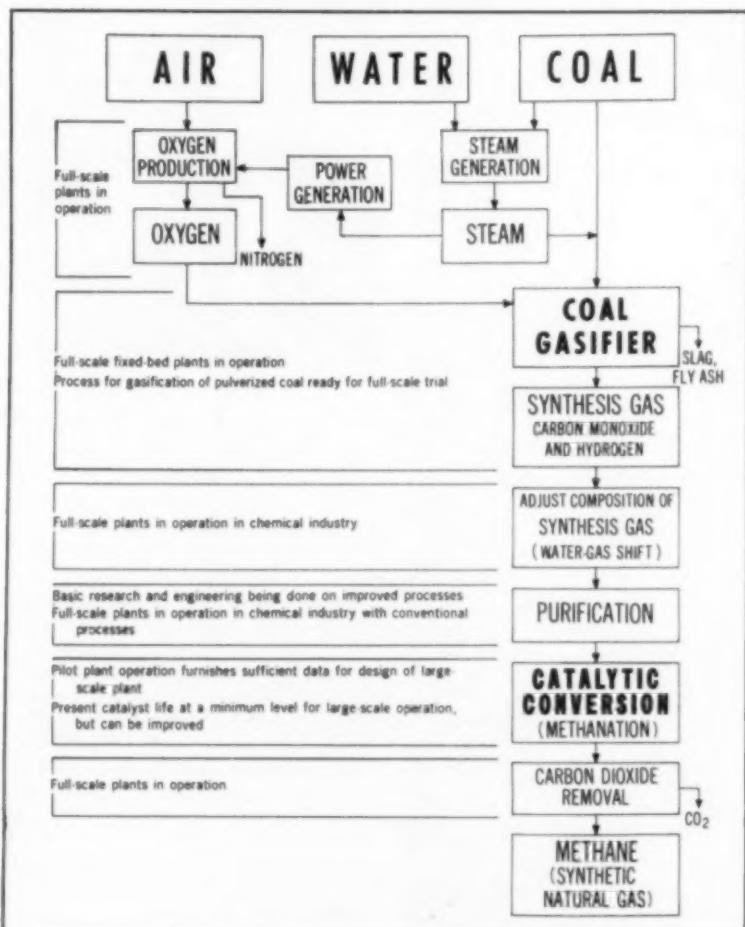
The most recent estimate indicates ultimate reserves of natural gas of 1,200 trillion cu ft, or about five times the present proved reserves. With this estimate, which is believed to be a conservative minimum, the pattern of future natural gas production in the U. S. indicates a peak output of 20 trillion cu ft annually around 1980. It is also estimated that the consumption of natural gas will increase from 10.7 trillion cu ft in 1957 to 16 trillion by 1966, and to 19 to 23 trillion cu ft in 1975.

Therefore, based on projected demand and estimated ultimate reserves, it would appear that coal may be used as a source of high-Btu gas in the 1970s. This is not a prediction, but merely an indication based again on a great oversimplification.

The oversimplification of using ultimate reserves and projected demands neglects several important considerations which could significantly affect the projections just discussed. Some of these neglected considerations and their possible effects will be mentioned briefly:

1. The size of the estimated ultimate reserves is very comforting, but magnitude is not the only criterion of ability to satisfy future demands. Deliverability is also an important consideration that is being studied by

## Low-Cost High-Btu Gas from . . . Via Upgrading Synthesis Gas

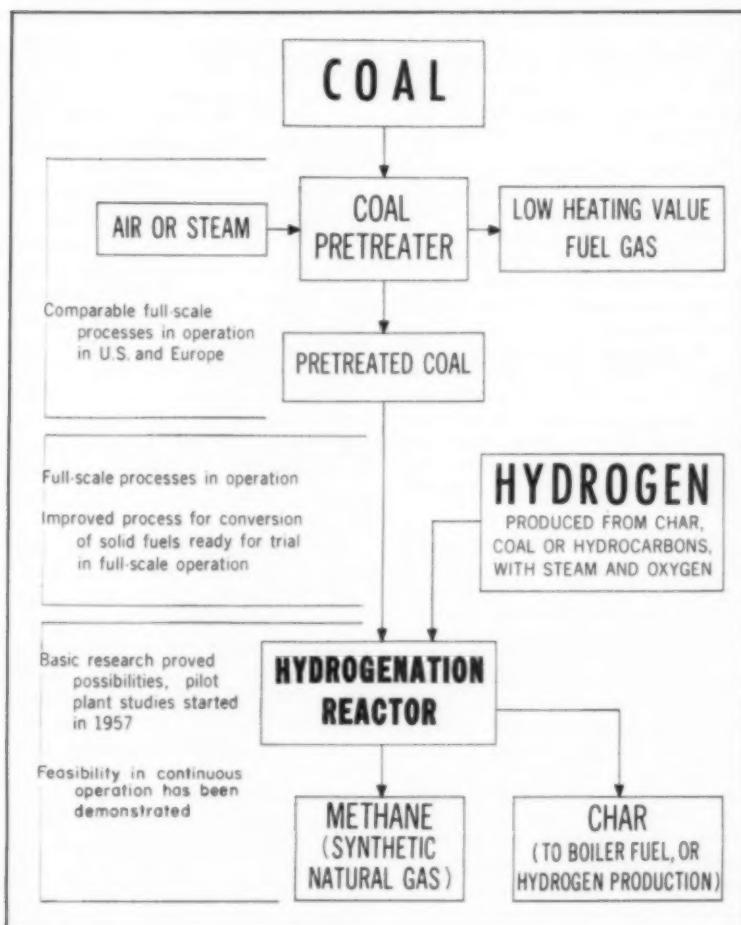


many companies. By deliverability is meant the capability of the future current proved reserves to satisfy the future current demand. Deliverability implies not only that the proved reserves must be sufficient to support the demand at the maximum economic withdrawal rate, but also that the reserves must be situated so that adequate supplies can be dedicated for long-distance transmission. Although no studies on deliverability have been published, preliminary work by some members of the industry indicates that supplemental gas supplies may be needed prior to 1970. Thus, coal may be used as a source of high-Btu gas not because of lack of total supplies, but because of limits imposed by deliverability.

2. Productive capacity and ultimate developed reserves depend on economic incentives, particularly on the price of crude oil. A recent study taking these and other factors into consideration has shown that maximum production of domestic crude may occur in the mid 1960s, and that the reserves actually developed may be significantly less than the current estimated ultimate reserves (Warren Davis, Gulf Oil Co., *Oil and Gas Journal*, Feb. 24, 1958, p 105).

3. The future price of pipeline gas has not been considered in the forecasts of demand. This does not necessarily invalidate demand forecasts, but it raises several interesting questions. For example, in those geographic areas where the future price

## Coal: Two Promising Routes . . . Via Direct Hydrogenation



of gas exceeds the price of competitive fuels it will be necessary to develop load to replace that which may be carried by competitive fuels. One possibility, of course, is air conditioning but this has limitations in certain geographic areas. Another interesting question is raised in connection with those companies now selling interruptible gas to help take care of seasonal variations in demand. If the price of gas increases above that of competitive fuels such companies will have to provide more underground storage near the point of consumption. Even today many companies rely almost completely on stored gas for meeting seasonal variations in demand. The trend toward increased underground storage is clearly in-

dicated by comparing the ultimate underground storage capacity of 3.4 trillion cu ft in 1956 with the 0.92 trillion cu ft in 1951.

### Economics in a Nutshell

Summarizing, some of the factors affecting the economics of gas supply in relation to coal as a source of high-Btu gas are:

1. Coal will be used as a source of high-Btu gas only when the wholesale price of gas is greater than that of coal. How much greater depends on the cost of making high-Btu gas from coal.

2. Geographic factors involving distance from gas supply and from coal

supply will have an important bearing on the need for high-Btu gas from coal.

3. Deliverability to the major marketing areas may be of greater significance than total ultimate reserves in determining the need for supplemental gas. Preliminary studies indicate that gas from coal may be needed in some areas in the late 1960s because of limitations imposed by deliverability.

4. The effect of gas price on demand is an imponderable that has not been considered in any forecasts.

### Research Objectives

The broad objective of research into the production of high-Btu gas from coal is to produce, economically, a gaseous fuel that has properties identical with or very similar to natural gas, and thus extend the service life of facilities using gas as a source of energy. Natural gas consists predominantly of methane, which is the simplest stable gaseous compound containing carbon and hydrogen. Therefore, any process that yields methane as its principal product may be considered for producing synthetic natural gas.

In any process development the basic objective is to minimize the overall cost of the product. This requires minimum cost of raw materials and maximum overall plant efficiency in relation to investment cost. In the case of processes for synthetic natural gas production, the major effort is on coal as a raw material because it is the most plentiful of our fossil fuels. From the long-range point of view, the production of synthetic natural gas is considered as a base-load operation. Under such conditions, it is highly desirable to minimize by-products.

With these objectives, research has been influenced by the following factors:

1. In long-range planning, gas utilities must consider all feasible sources of supply of high-heating-value gas.

2. Even though large reserves of natural gas exist, the cost of gas at the point of consumption in some regions of the country has increased to such an extent that consideration is being given to alternate sources of supply. Accordingly, the ultimate cost of synthetic natural gas puts a

## Nuclear Systems: Possible Dark-Horse Contenders

Nuclear systems are possible dark-horse contenders in the race to produce low-cost high-Btu gas from coal. Two systems are known to be under study:

1. A joint USBM-AEC effort which envisages using process heat from nuclear reactors to eliminate the high cost of oxygen.

2. A Columbia University project—sponsored by the Consolidated Natural Gas Co.—which aims to reduce processing costs by using radioactive cobalt 60 to catalyze the hydrogenation reaction.

**NUCLEAR HEAT**—The big problem in developing process heat from nuclear reactors is to break the "heat barrier"—this being temperatures in the range of 2,500 deg, or 1,000 deg higher than now achieved in power-plant reactors. Much work still must be done in developing reactor components suitable for this heat and in finding fuel elements that will enable an economical process-heat system. Economical, as used here, means cost that will be at least slightly less than presently available systems.

Helium in a closed-cycle operation will probably be used as the gas coolant—instead of oxygen—to transfer the heat for process use. USBM's Morgantown (W. Va.) Experiment Station is now studying the application of this principle in a simulated nuclear-reactor system using a conventional heat source. When suffi-

cient data is developed and further research is justified, AEC is expected to go ahead with plans to construct a test nuclear reactor, conceptual design of which has already been drawn up.

Through AEC's test reactor, it will be possible to determine the effectiveness of reactor components. Construction of the reactor will take 2 to 3 yr. Probably between 1960 and 1965, the economics of the nuclear-process heat system will be known. If the economics prove favorable and no insurmountable technical bugs develop, USBM will take over the system to advance coal gasification on a commercial scale. Rough estimates show that nuclear heat may reduce present operating costs for gasification (80c to \$1) by as much as 20%.

**RADIATION STUDY**—Research on the use of cobalt 60 to speed up the hydrogenation reaction in converting coal to natural gas was announced in December, 1957. Columbia University chemical engineers reported that testing on a very limited scale showed technical feasibility. A long-term research effort is visualized—possibly 20 yr—before the scheme could be made commercial. Apparent aim of the project: lower processing costs by reducing the reactor temperature and pressure needed in conventional hydrogenation methods.—The editors.

ceiling on the price of natural gas.

3. Process development and improvement take time. Therefore, the development must precede the full-scale commercial operation by many years.

Research on the production of high-Btu gas from coal has been concerned principally with two processes:

1. The production of methane from a mixture of carbon monoxide and hydrogen made from coal, oxygen and steam (methanation of synthesis gas).

2. The production of methane by the reaction of hydrogen with pretreated coal (direct hydrogenation of pretreated coal).

In comparing the two processes, it should be noted that direct hydrogenation of pretreated coal to pro-

duce methane has the advantages of less oxygen requirement and higher-methane yield. On the other hand, the technology of producing methane from synthesis gas is at present farther advanced.

### Methane Via Synthesis Gas

The methanation of synthesis gas requires:

1. A process for gasifying coal to produce synthesis gas, and,
2. A process for converting the carbon monoxide and hydrogen in the synthesis gas into methane.

**Synthesis Gas Production**—Economic studies of the gasification of pulverized coal in suspension with oxygen and steam have shown that the use of elevated pressures offers

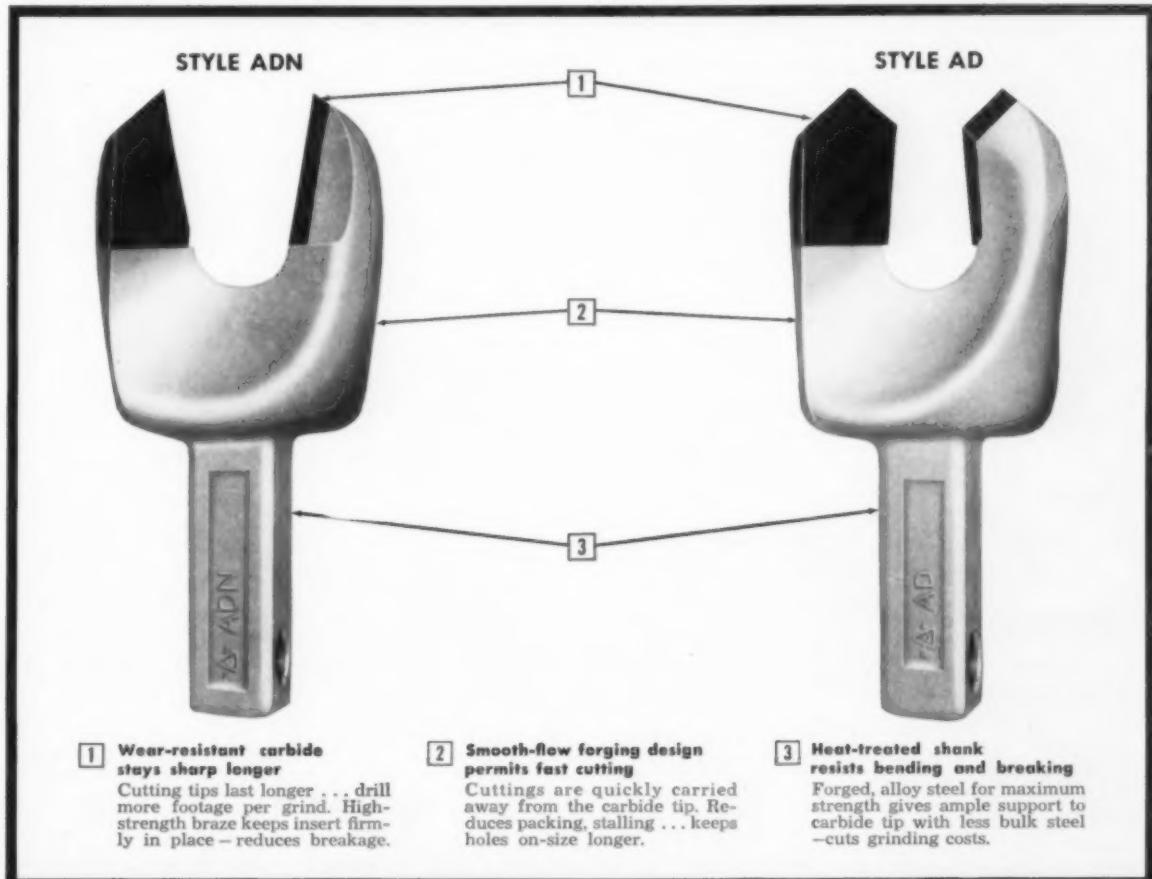
the greatest promise for minimum cost. Such processes have been studied extensively by the USBM, the Texas Co. and the Institute of Gas Technology. This work has conclusively demonstrated the technical feasibility of the process, and has furnished information on operating conditions for maximum economy and on the size of the gasification reactor required to do a particular job.

Undoubtedly many engineering problems will still be encountered in the operation of large-scale gasifiers using oxygen. Many of these problems cannot be solved in pilot units. Thus, work on the suspension gasification of coal under pressure has progressed to the point where further progress can be made only in large scale plants. These will permit an engineering and economic evaluation of coal feeding, refractory lining, slag removal, reactor-shell cooling, and energy recovery.

The gasification of noncoking coal with oxygen and steam in a fixed-bed Lurgi generator has been practiced commercially for many years. Plants are in operation in Germany, South Africa, and Australia. (*Coal Age*, September, 1957, p 81; September, 1955 p 54.) This process also operates at elevated pressures, and produces a gas containing methane, carbon monoxide and hydrogen. The characteristics of the coal are much more critical when a fixed bed has to be maintained than when the coal is introduced in pulverized form. However, since 1951 a stirred bed has been provided in Lurgi generators which permits the use of weakly caking coals. Though it has limitations as to the types of fuel, the advanced stage of the Lurgi development, along with the inherently low oxygen consumption, must be given serious consideration in the selection of a synthesis gas production process.

In connection with the Lurgi process, it should be mentioned that the USBM is studying a slagging-type Lurgi operation at Grand Forks, N. D., and that a slagging-type Lurgi generator has been erected at Solehill by the Gas Research Board of Great Britain, and another one is being erected by the British Coal Utilization Research Association. This latter generator is of considerable interest because it will not only operate slagging, but also will have a significant proportion of pulverized coal

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injected at the bottom of the fixed bed. The unit will have a capacity of 1 to 4 tph of coal, and will operate at about 100 psi. The outside diameter is 5 ft and it is 25 ft tall.

**Methanation**—Before raw synthesis gas can be converted into methane, the ratio of hydrogen to carbon monoxide must be adjusted, and the resulting gas must be highly purified to remove sulfur-containing compounds which poison the methanation catalyst. Conventional processes are available for accomplishing these steps.

Active catalysts with long lives are available for converting synthesis gas to methane in a fixed-bed operation. For the past several years, however, the Institute of Gas Technology has been developing improved catalysts which will be more resistant to attrition or size degradation. Also under development: a better method to remove the heat liberated when carbon monoxide and hydrogen react to form methane. This is needed to control reaction temperature and recover heat.

The question everyone wants answered is: What is the cost of high-Btu gas from coal?

At present only an approximate answer can be given, even though considerable effort has been expended on making detailed cost estimates by several organizations. In 1955 the Gas Operations Research Committee of the American Gas Association reviewed estimates made by several groups, and found the cost of synthetic natural gas to range from about 80c to \$1 per MCF of finished gas. This range of estimated costs results from:

1. Uncertainties in estimates of capital investment.

2. Uncertainties in the cost of certain process steps now undergoing development, for example, methanation.

3. The type of coal-gasification process used.

One thing is clear in the methanation process: The cost of the gasification step represents about 57% of the cost of the finished gas. Consequently, cheaper ways must be found to produce synthesis gas from coal as this holds the greatest promise of reducing the cost of high-Btu gas produced by the methanation process.

### Methane Via Hydrogenation

The production of high-Btu gas by the hydrogenation of coal involves these basic steps:

1. The pretreatment of coal to destroy its coking properties and prevent particles from agglomerating under hydrogenating conditions.

2. High-pressure hydrogenation of pretreated coal in a fluidized bed at temperatures of 1,300 F.

Experimental work on this process has been done by the USBM, the Gas Research Board, and the Institute of Gas Technology. IGT's work, done at a temperature of 1,350 F and at pressures up to 2,500 psi gage, showed that the process was feasible under batch reactor conditions. In these studies, information was obtained on the process operating conditions suitable for high-Btu gas production. Recently, we demonstrated the process in a continuous plant which can be operated at coal feed rates up to 10 lb per hr for several hours. This plant is in the early stages of its operation. The next step is to study process variables and yield data so that the best possible reactor design can be ascertained.

Once again, the question arises: What is the cost of gas by coal hydrogenation?

Earlier discussion has shown that the hydrogenation process has advantages over methanation in methane yield and oxygen consumption. Because of the lack of experimental data, no detailed cost estimates have been made on the coal hydrogenation process. But rough estimates indicate costs of the same order of magnitude as those encountered in the methanation process, possibly slightly lower.

Furthermore, the picture for reducing coal hydrogenation costs is quite encouraging. A variation of the conventional process, for example, is now under study. Preliminary rough estimates indicate that it may be possible to produce high-Btu gas by this process for substantially less than the costs cited previously. If this proves correct, then it moves the time at which coal will be used as a source of high-Btu gas up many years. Such promise justifies our conviction that continued progress will make coal an important source of high-Btu gas in the not too distant future.

## On Tap for Gas: Two Billion Tons of Coal

The Columbia Gas System—a producer and major distributor of natural gas in the greater Appalachian area—owns an estimated 2,000,000,000 tons of high-quality coal reserves in Wayne, Logan and Mingo counties, W. Va. If a coal gasification plant were set up in this area, relatively minor investment in added pipeline facilities would be needed to hook the plant up to the system's existing long-distance pipelines at Ceredo, W. Va.

Informed gas industry spokesmen say that such large coal reserves—near existing pipelines—are a long-term hedge against future needs for synthetic natural gas from coal. They add substantively:

The day is inevitable sometime in the future when natural gas supplies will have to be supplemented with a synthetic product based on coal. When in the future it is difficult to determine because of the many imponderables involved in the reserve-demand-price picture. The present price spread is much too wide with natural gas from the southwest arriving in the Appalachian region at a cost of 30 to 35c per MCF, compared to 80c to \$1 per MCF for the synthetic product.

The gas industry believes in a continuing research program to anticipate future needs for the synthetic product. Research has reached the point where a semi-commercial plant should be built to gain further cost and operating data. But a number of industry analysts figure the time is not yet ripe for the project. Only 5 to 6 yr of lead time is needed to accelerate the present research program. That point has not yet been reached. Meanwhile, investment in an accelerated program cannot be justified.

The case for depleted reserves is often overstated. Presently, there is a known supply of natural gas for at least 20 yr—and this is as far as the industry really needs to project demand satisfaction. New supplies will no doubt be found, perhaps from completely unexpected sources. This happened early in the 1930s with the tapping of huge Southwest reserves which have now become the main source of supply. Such an event could happen again. Deep drilling now underway in the Appalachian region (about 7,000 ft) may, for example, bring in large reserves not presently figured—The editors.

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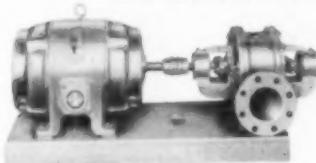
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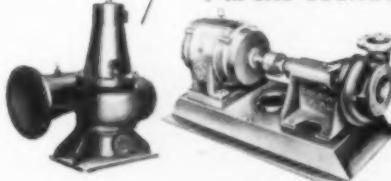
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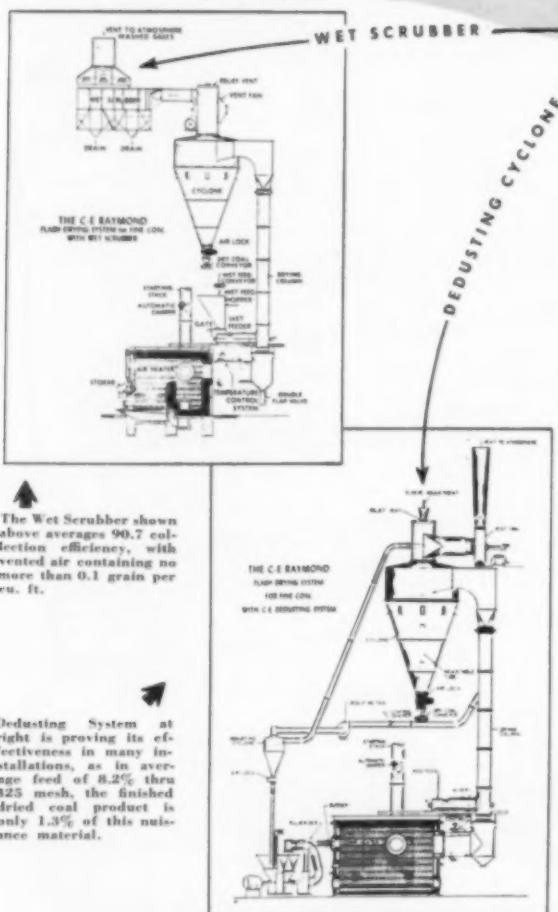
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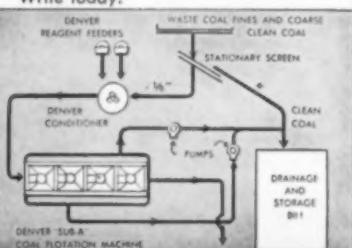
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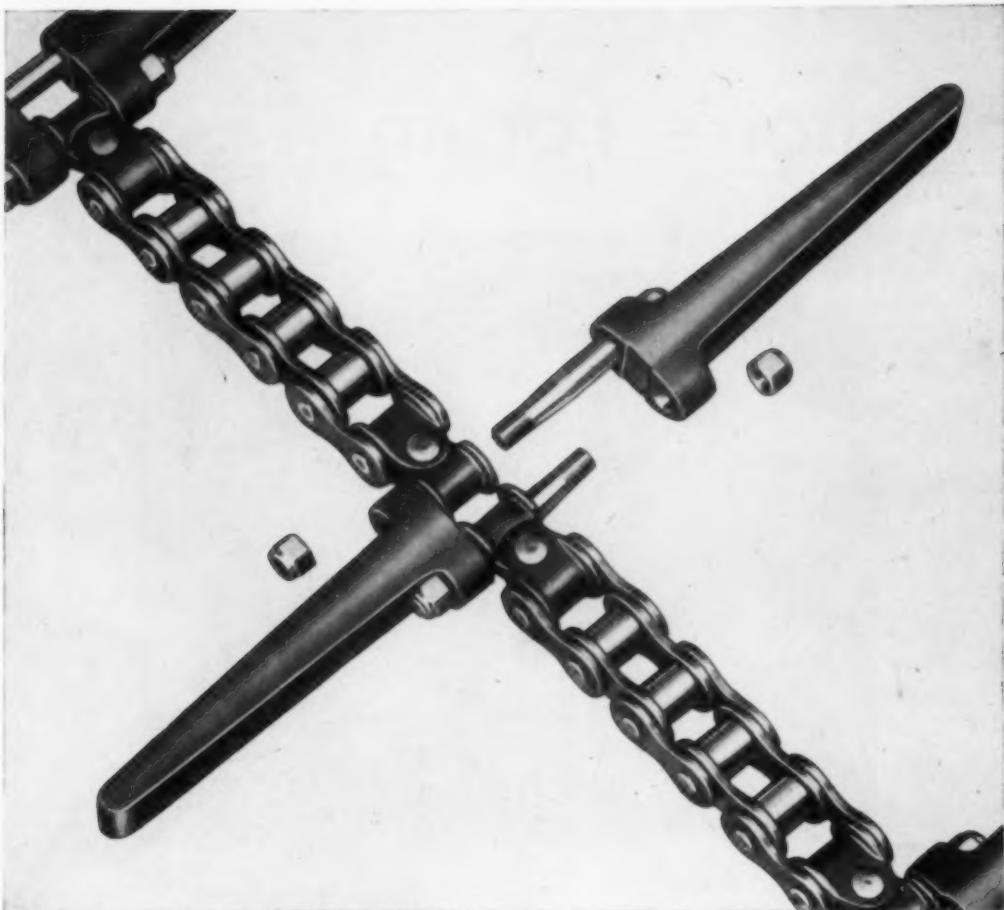
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With Whitney you have riveted\* chain construction for more firmly attached parts. The "plus" is—longer life, no lost cotter pins or fasteners, no loose side plates.

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Another, and vastly important PLUS . . . Whitney manufactures the entire product, both chain and flight, to assure completely balanced design, and a fast, complete customer service. Whitney distributors, located in all mining areas, carry full stock of mine chain and American Standard precision steel power transmission and conveyor chain. Field engineers always available. Catalogs on request.

\*Only Whitney Mine Chain design gives you the advantage of riveted construction. Cotter type available when specified.

Whitney  
CHAIN COMPANY  
312H HAMILTON ST., HARTFORD 2, CONN.

ROLLER CHAIN • CONVEYOR CHAIN • SPROCKETS • FLEXIBLE COUPLINGS • WHITNEY TORMAG DRIVES

# Foremen's Forum



**OBSERVE** your present equipment in action, look for gaps in your methods, then survey new units on the market and evaluate them as "gap fillers".

## Getting Equipment You Want

COAL-COMPANY PROPERTIES, like Fibber McGee's closet, can become cluttered with "white elephants," the gadgets, gimmicks and dingbats that are bought in weak moments and never used again. On the other hand, there are situations beyond number in which a carefully selected item of new equipment will make its presence felt by improving safety or reducing costs in some way. We propose now to set down some rules to guide supervisors in preparing their recommendations for the purchase of new equipment. These will help you ambush the white elephants and make your suggestions pay off. Here's how:

### Look at Your Present Equipment

Set up a schedule which will permit you to inspect and observe the operation of a single piece of equipment each day as you make your supervisory rounds. The unit you choose may be anything from a major mining machine to a haulage block signal or fused nip. Evaluate the item as you observe it by

asking yourself the following questions:

**1. Is it doing a job?** Does it perform a useful duty, such as picking up coal from the bottom and loading it into the transportation system, or does it support the roof, or does it detect methane?

All these are useful and indispensable, but you may see other items in the mine or in the cleaning plant that might be eliminated without an unfavorable reaction.

**2. Is it adding to efficiency?** One might say that if an installation is doing a job it certainly must add to efficiency. However, this is not always true. Perhaps the function the unit performs is not at all essential to the safe production of coal. Or perhaps the task may be performed by some other unit during its non-productive time, thus eliminating the white elephant and getting more use from the second unit.

**3. What happens if it breaks down?** Some units are critical with respect to safety or production or both. They must be kept in operation. As you observe each unit, evaluate it in terms of this critical value. Is it (1) indispensable,

(2) more-or-less important or (3) can a breakdown of indefinite length be tolerated? You may decide that an auxiliary unit or some modification of the existing one may be required, but more of that later in this checklist.

The pressure is on you more than upon anyone else to produce tonnage. Your job is to produce more, and you can do it by getting more out of the equipment you have or by making a good case for your recommendation that additional equipment be purchased. With the latter thought in mind, let's take the next step.

### Survey New Equipment Offered on the Market

You have many sources of information to tell you what is being offered in new types of equipment and improved models of older units. This is true of all kinds of mining supplies, too. For example, the manufacturers provide informative literature and catalogs, and your favorite business publication [plug -Ed.] provides a monthly review of



These High Strength Steel trailers were built by the Marion Metal Products Company, Marion, Ohio. Use of 12-gage USS Cor-Ten Steel, instead of 10-gage carbon steel, reduced weight 23%.

## High Strength Steel trailers increase payloads 50%

at Saxton Coal Corporation, Petersburg, Indiana

**When Saxton Coal Corporation** moved their strip mine location, the dump trucks had to travel twice as far to unload at the transfer tipple. To maintain their daily loading schedule they had to build a bigger fleet, or increase the payload of the trucks they were using—without going over the legal weight limit. Part of the route was on state highways.

They decided against more trucks and additional operating expenses, and solved their problem by purchasing High Strength Steel trailers that could be handled by their present tractors. "We increased the payload of each truck more than 50%," says General Manager Darwin-C. Youngs, "and we haven't exceeded the legal

weight limit on the roads we travel."

Payload is increased with High Strength Steel construction because High Strength Steel is much stronger than carbon steel. Trucks and trailers can be made lighter, and *the weight saved goes into the load instead of the carrier.*

High Strength Steel has greater resistance to atmospheric corrosion, impact and wear than structural carbon steel. It needs less maintenance and it lasts much longer.

United States Steel produces three brands of High Strength Steel—Cor-Ten, Man-Ten and Tri-Ten. Each has its own characteristics that make it ideal for certain applications in trucks and trailers. USS "T-1" Constructional Alloy and USS Stainless Steels are also available. If you want more information about how these steels can help your trucking operations, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS, Cor-Ten, Man-Ten, Tri-Ten and "T-1" are registered trademarks

United States Steel Corporation—Pittsburgh  
American Steel & Wire—Cleveland  
Columbia-Genova Steel—San Francisco  
Tennessee Coal & Iron—Fairfield, Alabama  
United States Steel Supply—Warehouse Distributors  
United States Steel Export Company



**United States Steel**

## Foremen's Forum (Continued)



**MEMO TO MANAGEMENT:** When planning new purchases, don't overlook the wealth of know-how on conditions and manpower possessed by your first line bosses.

important equipment developments. Furthermore, we are increasingly impressed by the numbers of top supervisors and managers who tell us they must review all advertisements because they can't afford to miss a bet.

You can evaluate prospective equipment which might serve a useful purpose at your mine or cleaning plant by asking these questions:

**1. What can it do for me?** Every piece of equipment is purchased on the assurance that it will return some benefits. The fulfillment sometimes falls short of the promise, but that may be a result of loose evaluation. In any event, as you evaluate your present equipment, look for gaps in your operating cycle which may be closed by units you discover as you explore the new-equipment offerings.

**2. What type do we need?** If you are an assistant foreman, you have more intimate knowledge of the local conditions that confront you daily than any other supervisor in the mine. These local conditions may have direct bearing on the type of equipment that should be bought. Speak up at staff conferences to make the points you feel are important. The final recommendation for purchasing will go to the front office from your superintendent, but he will be guided by your ideas in the matter. Your superiors trust your good judgment or you would be working elsewhere.

**3. Will it return its cost in service or safety?** Somebody can build a min-

ing machine to perform almost any task you care to name—at a price. But thrifty purchasing—and there should be no other kind in industry—demands that new equipment return its cost within a reasonable time through increased productive or safety benefits. This point should receive considerable attention as you explore the equipment market.

If you want to know more about the fine points in this matter of evaluating equipment, we suggest you return to the previous issue of *Coal Age* to study the special report on cost control.

### Selling Your Suggestions For New Purchases

Superintendents, by the very nature of their jobs and personalities, always look with a cold fish-eye on any suggestion for spending more money. Therefore, if you really believe you need some new equipment, you had better be ready to support your claim with facts. You will need answers to these questions:

**1. What are the specifications and limitations?** Know all dimensions and ratings of the equipment you want to have in your mine, section or cleaning plant. You may have many questions to answer in making your point, so have complete information on the tip of your tongue. You should also know the limitations of the equipment or materials. Know what it can't do and the ways in which it should not be used.

**2. Is auxiliary equipment required in applying the new device?** The cost or particular characteristics of these auxiliaries may be such that the new installation may have to be abandoned.

**3. How much will it cost to install the new item?** In preparation-plant projects, especially, it pays to study this phase carefully. Existing units may have to be moved, structural members may have to be supported or new ones added or partial dismantling may be required to get the new units into position.

**4. Is the total cost justifiable?** Decide now whether the benefits of the new addition will return the investment in measurable money or increased safety within a reasonable time. If you honestly believe it will, come forth with your suggestion for buying it.

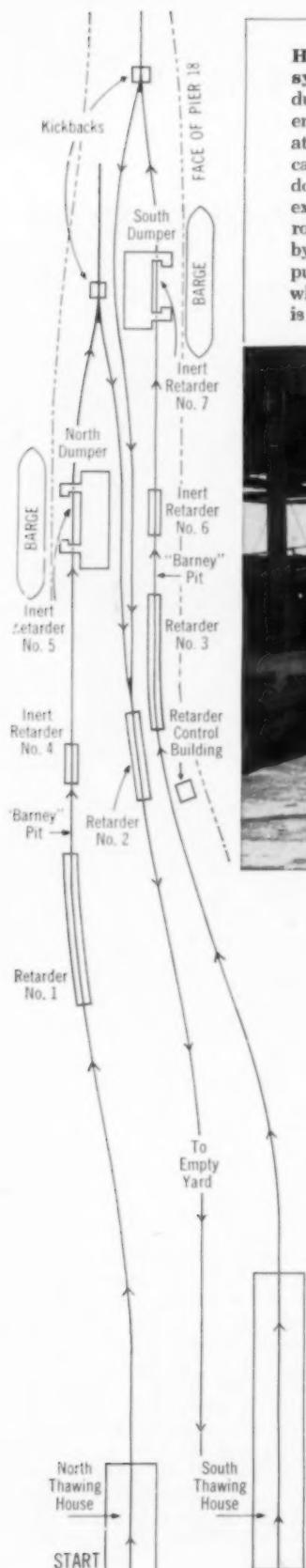
So much for the step-by-step process of evaluating equipment in order to get the kind you need. However, you should be aware of some follow-up steps you will have to take. Here they are.

Be sure you have the kind of men in your crew or mine who can make the new units operate effectively or who can absorb the necessary training. We know of one instance in which a maintenance chief advocated a change to a new lubricant. The new type was more effective than the old, but it was more expensive, too. This supervisor took time to train each of his men in the proper use of the new lubricant. Their former wasteful habits were corrected, and the result was fewer bearing failures with barely any increase in lubricant cost.

Production foremen quite often are given samples of new equipment to test under actual operating conditions. If you find yourself in this position some day, forget the brand name of the new material while you make a conscientious effort to put it through its paces. Then rate its value or lack of value under your conditions in a straightforward appraisal. And remember that if you recommend that the new materials be purchased for use, you may be turning up a real cost cutter or you may be gathering more white elephants. Try to be right.

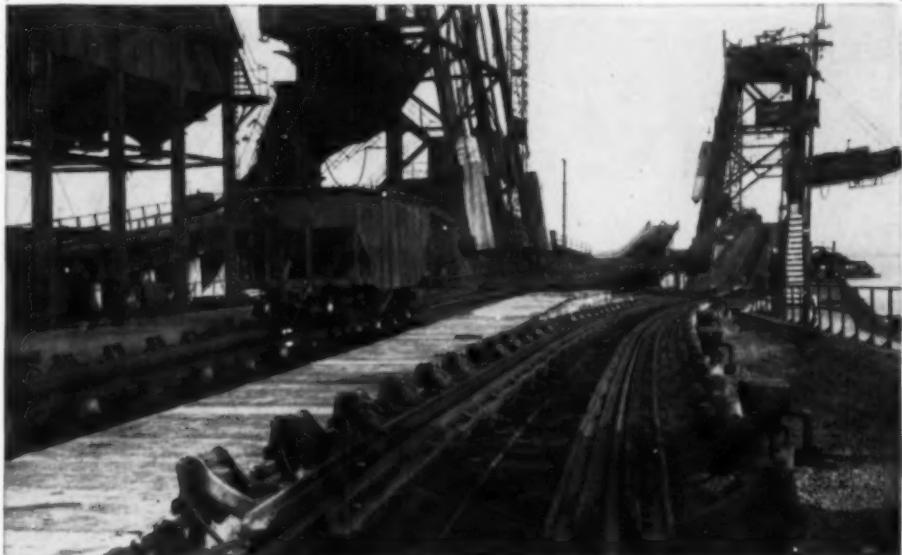
We now address ourselves to superintendents and higher officials. Don't overlook the good advice of production foremen when the question of whether to buy or not to buy comes up. They have intimate knowledge of the face conditions from day to day and the skills and aptitudes of their men.

If you do pass over this source of down-to-earth know-how, you may find that you have made a purchasing mistake. You will then find yourself saying to the production bosses, "Use this stuff in a hurry to get rid of it." The cost of supplies will go up with the rate of use.



**How the new UNION car-retarder system works** — Pier 18 has two coal dumping systems and both use the same empty yard. Following through the operation of the North dumper, a loaded coal car leaves the North thawing house, rolls down an incline to retarder No. 1 where its exit speed is reduced, so that when the car rolls on to the "barney" pit, it is stopped by inert retarder No. 4. A "barney" then pushes the car up the slope to the dumper where it is stopped by retarder No. 5. Coal is then dumped into a barge.

The next full car pushes the empty car off the dumper. It goes by gravity through a kickback and spring-switch combination for return through retarder No. 2 to the empty yard. Controls for the power retarders and switches are incorporated in a control machine housed in a new tower building. One operator in this tower surveys the operation and operates the control machine. He has loudspeaker communication with the thawing sheds, the control cabins on the dumpers, and the yard office.



General view of North and South dumpers showing No. 2 and 3 retarders in foreground. Car entering retarder is going to the empty yard.

## Fast, low-cost coal handling results from Automation at Pier 18

The Central Railroad of New Jersey recently modernized its coal dumping facilities at Pier 18, Jersey City, N. J. Now, one man sits in a tower, flicks a few levers, and controls loaded coal cars rolling by gravity to the dumpers and empty cars moving from the dumper to the empty yard. Formerly, this job required a crew of car riders and was a costly and hazardous operation.

Now, the job is handled quickly, safely and economically through a

system of UNION Electro-Pneumatic Car Retarders. Operating costs have been greatly reduced, and coal is promptly loaded for shipment by barge to New York and New England areas.

*What is your materials handling problem?* If it involves many car-loads of coal, ore or other products, let us show you what can be done with automatic car-retarder systems to increase efficiency and reduce costs. Write for information.



### UNION SWITCH & SIGNAL

DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY

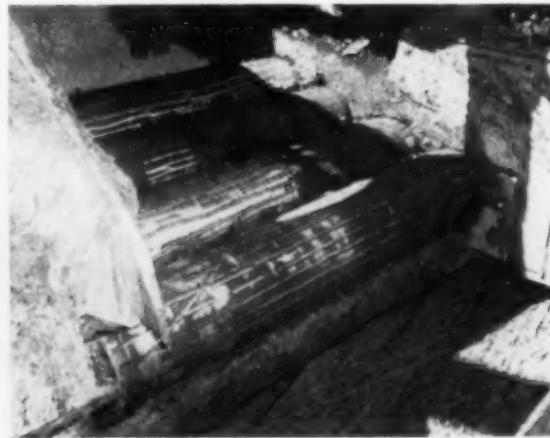
SWISSVALE, PENNSYLVANIA

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# Operating Ideas



ROLLER CONVEYOR increases efficiency of wheel excavator.



FOUR ROLLERS handle up to 100% more material.

## New Roller Conveyor Solves Side Loading Problem

A NEW roller conveyor developed by The United Electric Coal Companies of Chicago for use on the Kolbe wheel excavator simplifies side loading from the wheel to the conveyor belt. Patented in the U. S. and various other countries, the roller conveyor has been tested extensively for more than 2 yr and now is operating successfully on the Kolbe wheel excavator at Buckheart mine, near Canton, Ill.

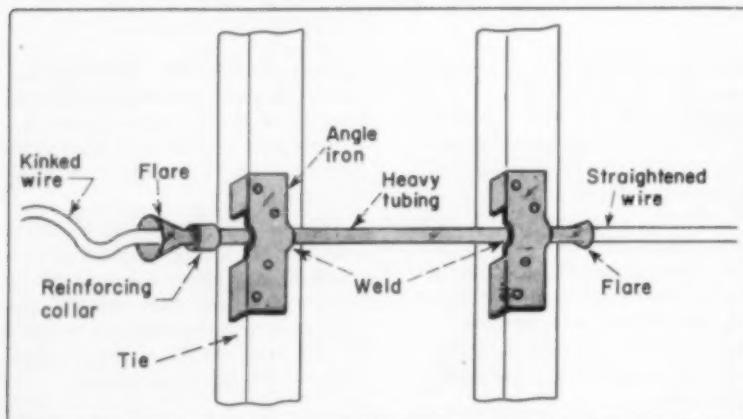
Material from the digging wheel flows onto the roller conveyor which

discharges it to the conveyor belt. The new roller unit handles up to 100% more material within the same discharge area needed for a conventional conveyor.

Up to the time that the new roller conveyor was developed one of the major operating problems has been the difficulty of discharging material from the wheel to the belt in a side-loading operation. Now, according to Frank F. Kolbe, president, tests demonstrate that the roller conveyor has solved this prob-

lem. It can handle a larger tonnage from a wider wheel. Thus, machine capacity is increased.

By controlling roller speed, it is possible to regulate side loading of material to the center of the belt to eliminate spillage. It also operates as a self-cleaning mechanism, eliminating slope sheet cleaners used with former devices. The roller conveyor has a longer life and greatly increased efficiency and economy in handling large tonnages of material.



## How to Straighten Kinked Trolley Wire

TAKING the kinks out of trolley wire is simplified with a straightening device

developed by Anthony Shacikoski, mining consultant, Avonmore, Pa. The de-

vice, which is lightweight and small, is spiked to the mine ties and the end of the kinked wire is threaded through the tube. A mine locomotive then pulls the kinked wire through the straightener. Mr. Shacikoski says that 1,000 ft of wire can be straightened in 10 min.

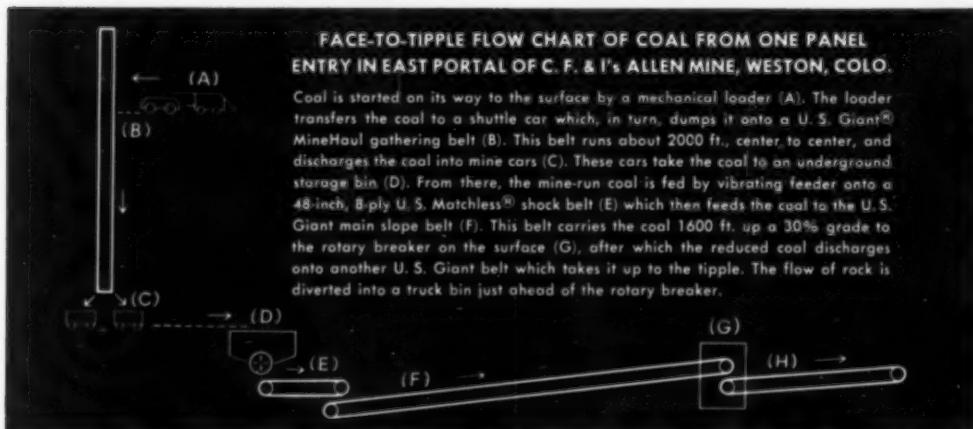
Components of the device include a piece of strong tubing which is flared at each end, a collar to strengthen the tube at the feed end and two pieces of angle iron with holes. The two angle irons and collar are welded to the tube as shown in the sketch.

When a piece of wire is to be straightened, the device is spiked to the ties in the center of the track. The end of the wire is straightened by hand and fed through the tube far enough so that a clamp can be put on it and connected to a locomotive. The flared ends of the tube prevent damage to the wire as it enters and leaves the straightener.



CONVEYOR BELTS

# NO TRAFFIC JAMS ON THIS UNDERGROUND HIGHWAY SYSTEM



30-inch, 4-ply, style XN, U.S. Giant Mine-Haul gathering belt receiving mine-run coal from shuttle car. Note use of U. S. Royalite Skirtboard rubber to facilitate loading.



48-inch, 8-ply, U.S. Matchless Ustex-Nylon main slope conveyor belt. It has already carried millions of tons of mine-run coal. Note the extreme conditions of cold and moisture.



This 320-ft. c-c belt is a 48-inch, 5-ply U.S. Giant. It carries minus one and one-half inch broken coal up a 9% grade from the rotary breaker to the railroad loading tipple.

The Allen Mine of The Colorado Fuel and Iron Corporation is one of the safest and most modern coal mines in the West. It is another fine example of engineering skills combining with U.S. Rubber belting to produce a maximum in efficient operation.

The mine was opened about five years ago and U. S. Rubber Conveyor Belts have been used almost exclusively in just about every phase of the face-to-tipple operation.

There has never been a belt failure and Mine Superintendent L. W. Ingles has expressed complete satisfaction with the belts.

For greater output at lower cost per ton, ask for U. S. Rubber's Three-Way Engineering. This service, plus a complete line of conveyor belting for any mining requirement, is available at the 28 "U. S." District Sales Offices or by writing us at Rockefeller Center, New York 20, N. Y.

In Canada, Dominion Rubber Co., Ltd.

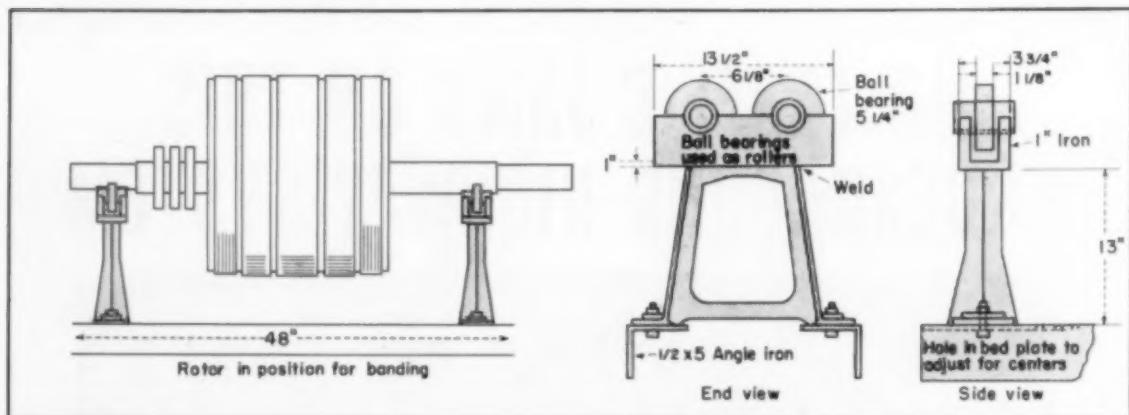


Mechanical Goods Division

## United States Rubber

See things you never saw before. Visit U. S. Rubber's new Exhibit Hall, Rockefeller Center, N.Y.

## Operating Ideas (Continued)



### Adjustable Stand Eases Armature and Rotor Work

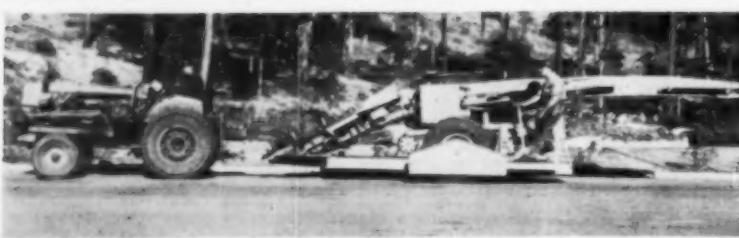
AN ADJUSTABLE, durable stand is difficult to find in equipment catalogs and hence most of them are built in the shop. The pictured unit was fabricated by H. K. Paul, Oak Ridge, Tenn. from a pair of discarded line shaft hangers that were discarded when individual motor drives came into the weaving picture.

While looking around for the best method of suspending heavy rotors and

armatures so they could be turned easily while tedious work was being performed, the idea of using two old ball bearings was suggested. Two bearings are mounted in each end of the stand and the rotor or armature shaft is placed on the bearings. It takes very little effort to rotate the rotor or armature when they are mounted this way. This is a big improvement over the old system of using adjustable

centers that matched the centers drilled in the shaft ends by the armature manufacturer.

The old-type stand was mounted on casters and pushed around the shop as needed. It was difficult to anchor when banding the armatures or rotors. The new device is permanently anchored near a window and tension on the banding wire can be as high as necessary.



### Special Trailers for Australian Mine

SPECIALLY DESIGNED TRAILERS are paying dividends at the Newstan Colliery at Toronto, New South Wales, Australia. These include a semi-trailer bus to transport miners, and a low slung two-wheel unit designed primarily for carrying crawler-mounted mining equip-

ment underground, thus easing the job of transferring large equipment.

Trailers are pulled by Clark tractors which were converted from gasoline to battery-powered units. The present motor is a 30-hp 1,500 rpm 80-V DC unit. The normal gearbox with its three

forward and one reverse speed together with a single-clutch was retained.

A suitable resistance designed to permit 50% torque, along with two contractors and a time-delay mechanism was assembled in a steel case over the motor. A switch was connected to the clutch pedal so that as it is released the first contactor closes with the resistor in the armature circuit, and at the same time loading a mechanical time delay. After about 3 sec, the time switch closes the second contactor, shorting out the armature resistance, thereby putting the motor across the battery.

At the rear of the tractor a sloping steel ramp and king pin were installed. This permits the semi-trailers to be quickly coupled or disconnected. A self-sealing hydraulic line on the trailers can be connected to the hydraulic braking system on the tractor.

Some of the advantages cited for the trailers include the ability to develop speeds up to 10 mph under adverse conditions and with a full load of 40 men. Grades of 1 in 6 can be negotiated while the units are hauling their full speed. By using a shunt wound motor on the tractor, full regenerative braking is achieved when going down grades. Thus power is fed back into the batteries.

# A MILE - STONE ..... • OF ..



RESEARCH



ENGINEERING



MANUFACTURING

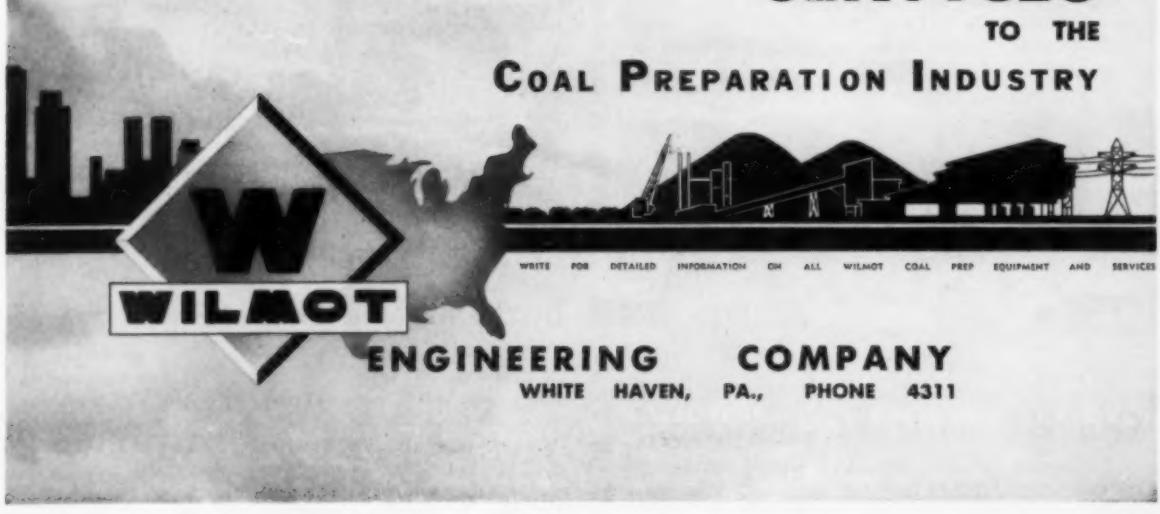


CONSTRUCTION

## SERVICES

TO THE

COAL PREPARATION INDUSTRY



# Equipment Developments



## New Low-Seam Shuttle Car

A shuttle car with six wheels and twice the capacity of previous low-seam models is announced by Joy Mfg. Co., Pittsburgh 22, Pa. Model 18-SC is only 27 in. high, yet it carries 4½ tons of coal at 3.5 mph. It empties a full load in 27 sec, reports Joy. By adding two wheels to the shuttle car, company engineers were able to design a very large, fixed-height conveyor, 6 ft wide and 27 ft long. Previously, on four-wheeled shuttle cars, increasing car capacity required increasing the size of wheel units for proper weight distribution and load bearing; in turn, this required larger wheel wells which took away from payload space. Joy, therefore, added extra wheels to maintain good load characteristics while reducing the size of each wheel used. The shuttle car is hinged and actually bends in the middle when climbing up and down small rises. With this hinged design, you can run the discharge end of the car up a ramp when an elevated discharge is desired. The two wheels in front and those in the rear have special pivot mountings which enable the car to stay level while moving on a banked or slanted bottom. The wheels in front can tilt in one direction while the rear wheels tilt in the other. The machine weighs 23,000 lb and has total horsepower of 35. Its ground clearance is 5½ in.



## Quick Electrical Connections

A new type of cable connector with two identical cable clamps that bolt together, makes it easy to interchange hookups

between most sizes of single conductor cable. Ohio Brass Co., Mansfield, Ohio, manufactures the "Cap Screw." This connector, Type-CSA for aluminum cable, is similar to and interconnectable with the firm's widely used Type-CS for copper cable. When a connector half is left attached to the end of a cable, you can connect it quickly to any other connector half by tightening two cap screws. This setup makes it possible to join copper to copper, copper to aluminum, or aluminum to aluminum, regardless of size. These connectors are good for adding or removing sections of machine cable or feeder, for making switch or panel connections, for making three-way connections and other similar applications, says the firm. They are said to be strong, and have high current capacity.



## Fast, Simple Cable Changes

A new load socket with two wedges simplifies changing cable, says Page Engineering Co., Chicago 38, Ill. Usually load sockets have one wedge. Page's socket has a bottom wedge that slides back and forth on a pin and slot arrangement, and a top wedge that is completely removable. With the cable in place, wrapped around the top wedge, the two wedges slide forward and hold the cable in place firmly, says the company. To release the cable, a workman just taps either wedge with a hammer and the bottom wedge will move back into its slot, releasing the pressure. The top wedge is then lifted out and the cable removed. These load sockets are heavily reinforced on the bottom and other points to prevent wear and increase life. They come in a complete range of sizes for cable from 1½ in. to 3½ in., with single, double or triple eye connections. The manufacturer declares that the socket, with its unique design, virtually eliminates all downtime and trouble formerly present in removing cable from the load socket.

## Bottom-Hole Drill

"Rototool" is a percussion tool that drills at the bottom of the hole. This drill, made by Schramm, Inc., West Chester, Pa., makes possible fast, economical drilling in hard rock that stops ordinary rotary drills, asserts the firm. The new tool has only three moving parts. Its hammer is heavier than ordinary hammers, thus it breaks up the rock better and gives faster penetration, according to Schramm. Because percussive action

# WILLISON

*automatic*

## COUPLERS

WILLISON

**for safety,  
speed, strength**

If your operation involves haulage with locomotives and cars in the 1 to 30-ton range, it will pay you to investigate the advantages of Willison Automatic Couplers.

Willisons are *Safer*—because they couple automatically...*Faster*—because they're self-aligning...*Stronger*—because they take the full buff and pull forces without depending on intermediate parts.

Over 100,000 Willison Automatic Couplers are in daily use in mines, industrial plants and foreign railroad service because they're *safer...faster...stronger*.

**NATIONAL MALLEABLE and STEEL CASTINGS COMPANY**

Established 1868

Cleveland 6, Ohio

Canadian Subsidiary  
NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY OF CANADA, LTD.  
128 Simcoe St., Toronto 1, Ontario

WILLISON AUTOMATIC COUPLERS • RUBBER CUSHIONED UNITS  
MINE AND INDUSTRIAL CAR TRUCKS • NACO STEEL WHEELS  
NACO STEEL LINKS AND SWIVEL HITCHINGS

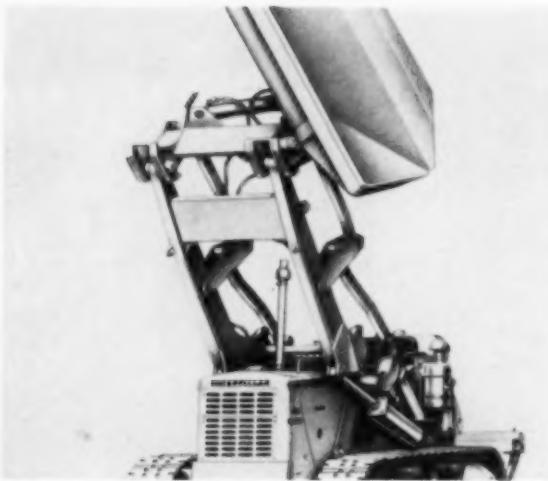


is contained entirely within the drill, the machine loses no power through the drill pipe. A special bit with six carbide tips bites straighter, cleaner holes, and unrestricted air passages in the tools enable the full capacity of the air compressor to pass through the bit to clear the hole of cuttings or water. You can get "Rotatool" in two models. No. 3875 takes a 4½ in bit and requires 100 cfm of air at 100 psi to operate. The larger size, No. 5250, takes 6- and 6½-in bits and requires 350 cfm of air to operate. Both tools were developed for use with Schramm Rotadrills.



### "Air Blast" Bits Lower Costs

Chicago Pneumatic Co., New York 17, N. Y., is now making rotary bits for air blast drilling. With techniques similar to those used in oil fields, you can get fine performance and reduce blast-hole drilling costs as much as 35% over conventional percussive drilling methods, says the firm. Quarrymen, contractors and miners using these methods drill holes up to 12½ in in the hardest formation successfully, it is noted. Several things control penetration rate: pressure on the bit; rotational speed and the amount of air needed to keep the hole bottom clean. Chicago Pneumatic has a three-cone bit for every formation, whether the rock is soft, medium or hard. Bits with long, sharp, widely-spaced teeth are good for softer formations while a bit with short, husky, closely-spaced teeth works best in hard formations. The company makes two types of three-cone "Air Blast" bits. In the standard model, the air blast passes through the bit center. On the jet "Air Blast" (photo) external nozzles force high pressure air towards the outside of the hole jarring cuttings loose and boosting them to the surface so the bit can get a clean, full bite.



### Side Dumping

It is now possible to get a side-dump bucket on the largest Traxcavator model made by Caterpillar Tractor Co., Peoria, Ill. The company has designed a new 2½-cu yd side-dump attachment for No. 977 tractor because of fine results achieved with other side buckets on Caterpillar No. 955 and 933, it is reported. The new tool is said to be especially useful in stockpile loading, excavation of broken or loose material or loading in confined areas. Caterpillar Co. talks about the benefits of these side-dump setups. These benefits include increased efficiency because the machine does not have to turn around each time it loads, reduction of ground scuffing and easy operation in confined areas. Mounting the bucket is easy because the same pins, bolts and nuts for a standard bucket are used. Other features of the machine are 40-deg ground level tilt-back and a bucket control for one hand.



### Rugged New Tractors

The tough looking tractor in the picture has a Davis loader mounted on it. The tractor, "Work Bull" 202, is a product of Massey-Ferguson Industrial Div., Massey Ferguson, Inc., Wichita 13N, Kan. The company, stepping up its production, is making this and other more powerful models, all of which are "power-matched" for better performance. Model 202 serves as an example with its 40-hp engine that develops tremendous lugging ability because of greater torque, declares the firm. The loader attaches directly to the tractor, and the pump drive and mounting are built right into the tractor. Massey-Ferguson lists other features of their tractors such as no-shift, instant reversing, power steering, torque-converter, and load-shock absorber for the lift arms. The firm adds that

**B.F.Goodrich**



## Why miners choose B.F. Goodrich tires



## for the really tough jobs!

THE trucks above haul 20 to 25-ton loads out of a Pennsylvania strip mine. Roads are steep, winding and strewn with jagged pieces of rock. These rugged operating conditions once caused tire blowouts, premature failures and sky-high costs. Then the truck operator switched to the tires you see—B.F. Goodrich Rock Service tires. The report: B.F. Goodrich Rock Service tires "take it" so well they can be retreaded again and again!

This experience is typical. Miners report longer, trouble-free service and

more retreads with B.F. Goodrich Rock Service tires. The B.F. Goodrich FLEX-RITE NYLON cord body withstands double the impact of ordinary cord materials, resists heat blowouts and flex breaks. This Rock Service body outwears even the extra-thick tread, can be retreaded over and over!

Husky Rock Service cleats grip the ground to give positive traction in forward or reverse. Take a tip from miners on the really tough jobs—switch to new B.F. Goodrich Rock Service tires with FLEX-RITE NYLON cord

body. See your B.F. Goodrich dealer today—he's listed under Tires in the Yellow Pages of your phone book. *B.F. Goodrich Tire Co., A Division of The B.F. Goodrich Co., Akron 18, Ohio.*

*Specify B.F. Goodrich Tubeless or tube-type tires when ordering new equipment*



**Smileage!**

# B.F.Goodrich *truck tires*



# Permissible Pete

In every job, there are always a few  
who work harder than the others do.  
Of these few, there is always one  
that sees the job is correctly done.

Such a man is Permissible Pete,  
toughest man you'll ever meet.  
Whether judged by brain or measured by might,  
he stands out front clear as day from night.

Coal is his business, blasting his task  
(underground mining to those who ask)  
But let's take a look at part of his day  
and follow Pete along his toilful way.

Out at the mine as the dawn unfolds  
he's anxious to find what the new day holds.  
By checking his tools and seeing his crew,  
he knows they're ready to start work anew.

Down into the mine and up to the face  
where today's blasting will soon take place.  
After undercutting the coal, Pete proceeds  
to drill blast holes in the pattern he needs.

Then Permissible Pete shows us why  
he's regarded as such a brainy guy.  
Into each hole he expertly applies  
permissible charge that Austin supplies.

With Austin dynamite, there's no doubt  
about the results that now come about—  
large lump coal with hardly any fines,  
just what's wanted by profitable mines.

With coal quickly loaded, the men begin  
the same operation all over again.  
And so it goes as time passes by,  
with daily tonnage exceptionally high.

\* \* \* \* \*

If Pete were asked, he'd probably say  
"We're boosting production the Austin way."  
Then he'd continue proving to you  
Austin permissibles can boost yours too.



**AUSTIN POWDER COMPANY**  
CLEVELAND 13, OHIO



*This 71-B diesel-powered coal loader, equipped with 5 1/4-yd. coal dipper, scoops up coal fast at a Kentucky mine. Ward Leonard electric 71-B also available.*

## **71-B Puts Power to Work To Speed Up Coal Loading**

Torque converter drive on the 71-B balances speed and torque to meet varied loading demands in the coal fields. It automatically selects the maximum engine speed within governed limits to deliver more power continuously to the dipper lip for greater overall output. The torque converter also cushions the engine and main machinery against shock loads . . . eliminates engine stalling.

For greatest operator efficiency, the 71-B is equipped with full air control, not just air assist,

on all operating clutches and steering and digging brakes. This permits fingertip control of the load . . . boosts operator efficiency.

For a full rundown on the 71-B coal loader, contact your Bucyrus-Erie distributor now. He will be glad to outline the many 71-B features that can move coal faster, make more money at your mine. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

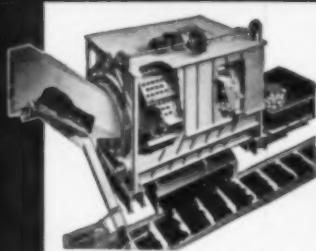
545E5BC

*A Familiar Sign . . .*

**BUCYRUS  
ERIE**

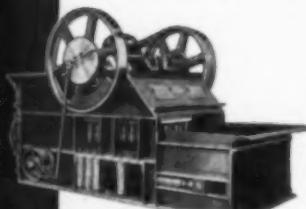
*. . . at Scenes of Progress*

## America's most complete line of CRUSHING EQUIPMENT



**McNally Pittsburg  
Rotary Breaker**

This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.



**McNally Norton Vertical  
Pick Breaker**

50% Less fines when reducing lump to egg and stove sizes.



**McNally Double Roll  
Gearmatic ROM Breaker**

Built in tonnage ranges from 750 tph to 1400 tph. Full Gearmatic drive.



**McNally Gearmatic Stoker  
Coal Crusher**

This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.

### AVAILABLE

From Stock and on Short Delivery

For immediate action on complete information write, wire, or call.

**McNALLY PITTSBURG MFG. CORP.**

Pittsburg, Kansas

Wellston, Ohio

## Equipment News (Continued)

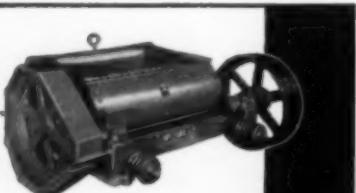


### Coupling for Pipelines

You can get new, quick couplings for use on portable pipelines from McDowell Mfg. Co., Pittsburgh 9, Pa. "Fast Line" is the name of the coupling . . . you just insert the tube end into the coupling and turn the lock nut to secure the unit, says the manufacturer. It is noted that average assembly time per joint with a two-man crew is 15 to 30 sec, and that labor costs can be reduced as much as 80% on installation of this line alone. "Fast Line" is flexible and can be installed in lines that operate over uneven land, and couplings can be salvaged from old pipe and reused. Recommended operating pressures for the couplings are 0 to 600 psi and bursting pressure is 1,800 psi. They are available in sizes for 2 and 2 1/2 in pipe.

### Front-End Loader

A front end loader with rubber tires and 2,500 lb carrying capacity is one



**McNally Single Roll Crusher**  
Universal application 20", 24" and 36" diameter rolls.

of Frank G. Hough Co.'s (Libertyville, Ill.) latest machines. This Payloader, Model H-25, has more capacity and is larger and heavier, says the firm. Yet it can be operated in and out of boxcars having 8-ft doors because it has a shorter turning radius (6 ft to outside rear hub) than any other rubber-tired tractor, it is reported. The machine also features power-shift transmission, and full reversing. It comes with a choice of gasoline, diesel or liquified petroleum-gas power.



### Repairing Equipment

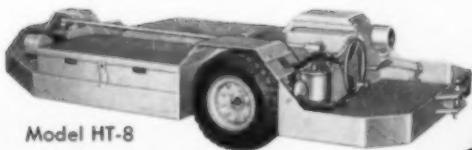
Homalite 345 is a new epoxy-based compound for repairing metals, plastics, wood, concrete and other materials. The special material, a product of Homalite Corp., Wilmington, Del., adheres to any clean, dry material and dries so fast that the repaired item may be back in service within an hour, states the firm. The company adds that many maintenance departments are turning to this new method of repairing leaking pipes, broken castings or plastics and corroded sheet metal because it is so easy and quick.



### Get Bigger Payloads

A semi-frameless dump trailer of aluminum with a 3,000-lb extra weight capacity is a new product of Lodestar Corp., Niles, Ohio. The trailer is 22 ft long and has a 26 cu yd capacity. It weighs 8,900 lb, this being about 3,000 lb less than conventional steel trailers, reports the company. The floor of the body is a formed, one-piece unit and aluminum except for a steel latching mechanism, bearings, bushings and pins.

# KERSEY keeps Coal Moving

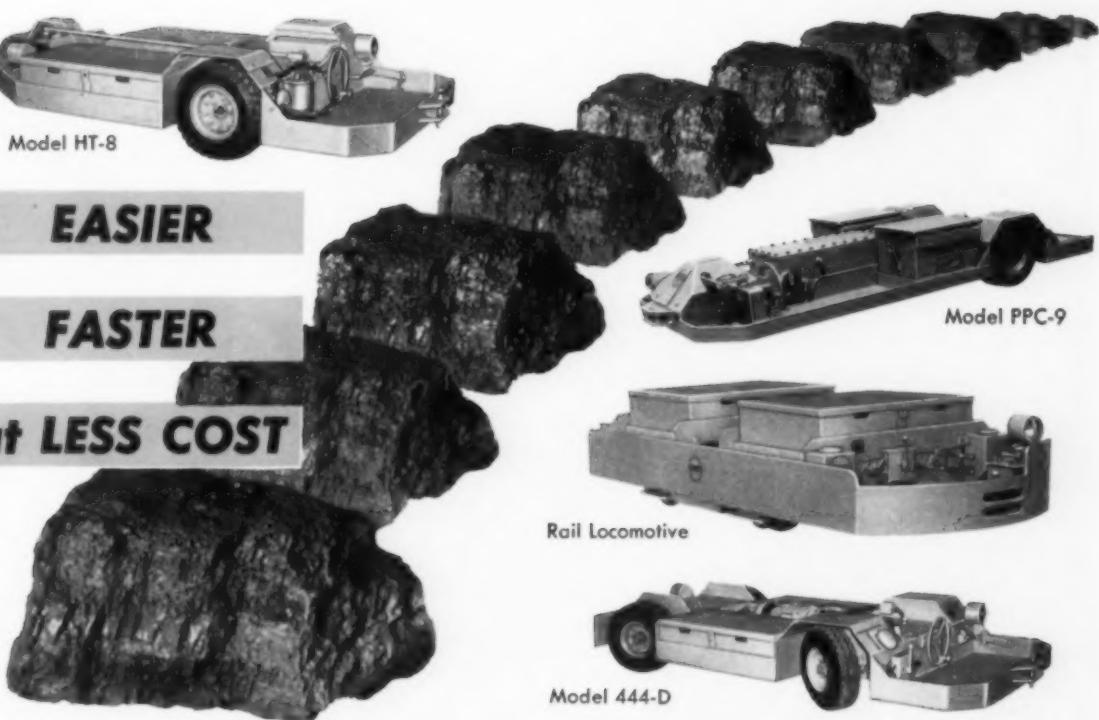


Model HT-8

**EASIER**

**FASTER**

**at LESS COST**



Model PPC-9

Rail Locomotive

Model 444-D

## NOW - Safe with Permissible Equipment

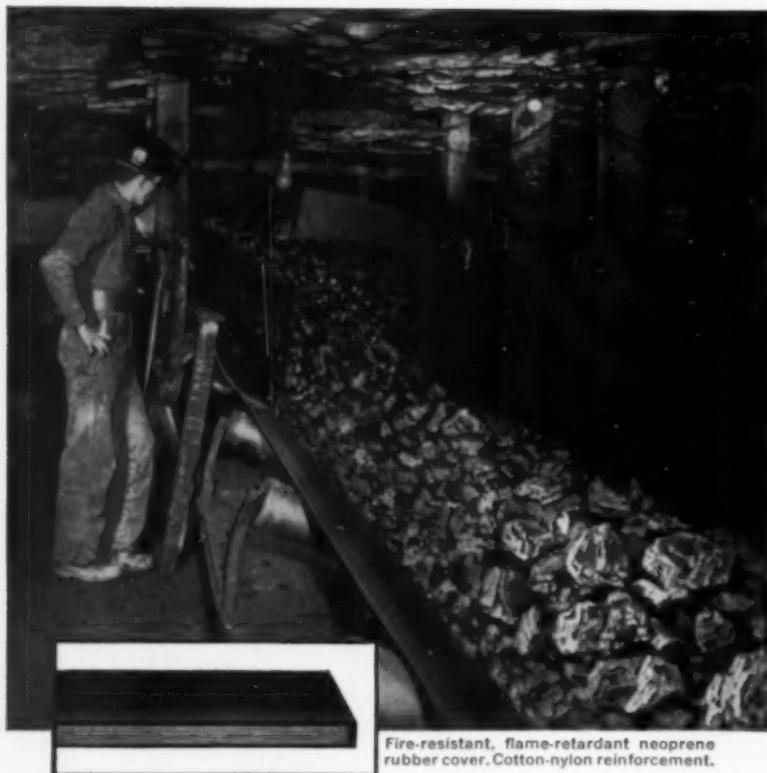
Kersey celebrates its decade of designing and building the best in battery-powered tractor and rail-locomotive equipment for the coal industry by now adding permissibility in emergency vehicles, utility, supply and personnel tractor equipment.

Approved by The U. S. Bureau of Mines (Acceptance No. 2-1285) Permissible, Explosion-Proof Units are Kersey's answer to the increasing need for coal and better ways to mine it.

WHEN YOU WANT  
MODERN EQUIPMENT  
FOR MODERN HAULAGE  
AND WANT THE BEST—  
CHECK WITH KERSEY FIRST!

If you want to  
see Kersey Mine  
Haulage Equip-  
ment in operation  
— ask us for the  
name of the near-  
est operator to  
your mine.





Fire-resistant, flame-retardant neoprene rubber cover. Cotton-nylon reinforcement.

## Rugged, reliable Quaker conveyor belting BETTERS THE U.S.B.M. 28-11 FIRE-RESISTANCE STANDARDS

Quaker fire-resistant conveyor belting set something of a new unofficial standard when tested against the U.S. Bureau of Mines designation U.S.B.M. 28-11. Under their specified flame test, burning of the belt is permitted up to one minute after it is ignited. When Quaker belting was subjected to this test, the flame went out *immediately*, while afterglow disappeared in one-third the permitted time.

Underground safety is just one of the features of this fine conveyor belting. Quaker U.S.B.M. 28-11 is light in weight and extremely flexible, yet tough

enough to take shock, impact, and the abrasive wear of heavy, jagged loads.

Get Quaker safety, service, and strength for your mine's belting. Call your Quaker industrial distributor for the full story, and for valuable assistance on all problems involving industrial rubber products.



**FREE BELTING CATALOG**  
For complete information on all standard grades of Quaker conveyor belting, send for this illustrated catalog. Write today to QUAKER RUBBER DIVISION, H. K. PORTER COMPANY, INC., Philadelphia 24, Pa., or Pittsburg, California.

**H. K. PORTER COMPANY, INC.**  
QUAKER RUBBER DIVISION

### Equipment News (Continued)

The company adds that there is an effective locking mechanism supporting the A-frame and upper kingpin plate when the tractor is unhooked. The trailer rests on telescopic dollies. Heavy-duty hardware is used on the tailgate that slopes to allow run-off of snow or rain.



### Manual Welding

A new manual unit for inert-gas shielded arc-welding is a new product put out by Air Reduction Co. Inc., New York 17, N. Y. The company states that the unit is easy to install and represents a completely new type of wire-feeding system to handle the broadest range of wire types and sizes from the finest to the heaviest. This "Aircomatic" system is said to be an indispensable tool in metal working. In the new model, both "push" and "pull" guns are available to cover all wire sizes and the operator can take it wherever he goes.



### Pocket pH Meter

You can speed pH control of mining and ore flotation with a handy pH meter that fits in your pocket, reports Beckman/Scientific Instruments Div., Fullerton, Cal. The unusual thing about this on-the-spot meter is its combination glass and reference electrode that is the size of a fountain pen. This electrode, with its 36-in lead, clamps snugly to the

meter, and can be used in this position when lead-length is not desired. The meter costs \$99.50.



### Wrench Extension

A special extension unit made by Owatonna Tool Co., Owatonna, Minn., can double the effectiveness of torque in ATC wrenches. A 150-ft-lb wrench, for example, can now produce up to 300 ft-lb without pulling any harder on the handle, says the firm. The new OTC extensions are made up of two pieces: a tubular steel adapter arm with a square opening to fit the torque-wrench drive and one of the many drive-end accessories—box wrenches, etc. The drive end can be quickly fitted or replaced on the tubular arm asserts the firm.



### Wire Rope Lubricant

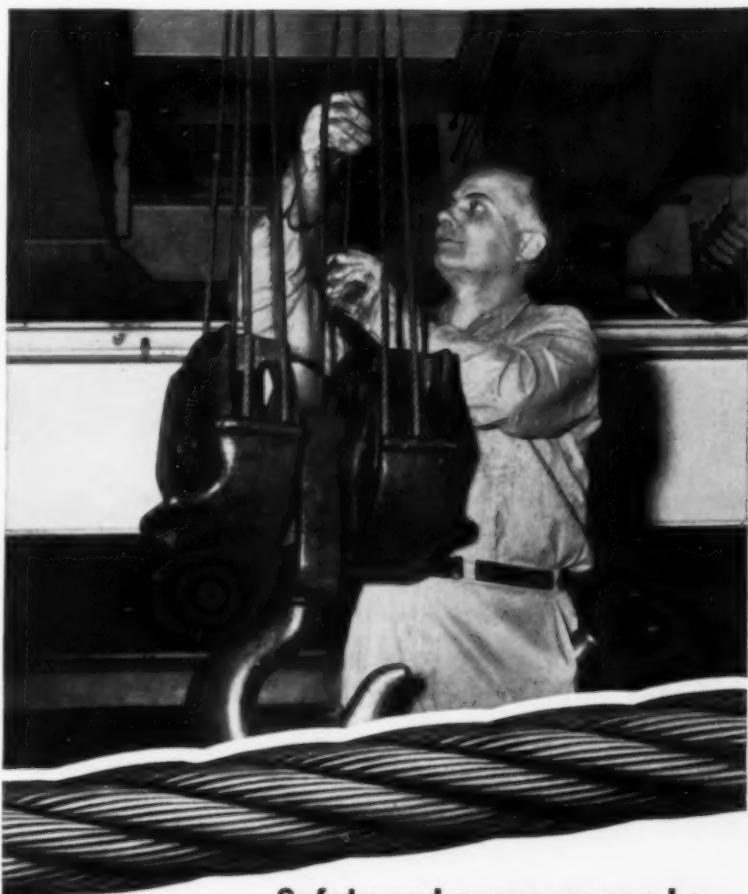
Whitmore Mfg. Co., Cleveland, Ohio, is offering a free trial sample can of spray-on lubricant that protects wire rope and cable. Packaged in a 16-oz push button aerosol container, the lubricant is designed to provide mining, construction and manufacturing with a handy method of application to wire rope and cable. The lubricant absolutely eliminates rust and corrosion of rope and cable, asserts the manufacturer, and its "non-gumming" qualities reduce "carry-back" of abrasive dirt and dust.

### Sonic Filtering

New "Novo" sonic sifting and filtering machines have five times the capacity of present-day mechanical operated machines, yet use less than one-third the power, announces United Specialties Co., Chicago, Ill. The sonic machines that the company has are said to be capable of separating particles of 1/2 in. in diameter and larger to as fine

# inspection...

is this your wire rope problem?



**Safety and economy can be greatly improved by methods described in LESCHEN RED-STRAND BULLETIN NO. 104**

Without adequate inspection, a severely damaged rope might remain in service until sudden failure and thus bring disaster. Such danger will be foreseen and adequate safety measures adopted in plenty of time, however, wherever a well organized program of periodical inspections is maintained. Bulletin No. 104 gives detailed instructions for setting up and maintaining such a program, tells what to look for and what findings mean. Copies sent free on request. Write to H. K. Porter Company, Inc., Leschen Wire Rope Division, St. Louis 12, Mo.

**LESCHEN**  
Red-Strand  
WIRE ROPE

**H. K. PORTER COMPANY, INC.**  
LESCHEN WIRE ROPE DIVISION

BUCYRUS-ERIE COMPANY uses 14 Timken bearings at critical points in the crowd, main and swing machinery of the "River Queen" to take radial, thrust loads in all combinations.



## Giant shovel swings 80-ton bites 300 ft., stacks 'em 100 ft. high, 14 TIMKEN® bearings take the loads

IT'S a whopper!—this Bucyrus-Erie 1650-B stripping shovel. It weighs in at over 2,400 tons, rises 140 ft. high. Taking 80-ton bites of overburden, it can pile up a "mountain" of 100,000 tons in a 24-hr. period. 15 electric motors power the giant, one of the largest mobile land machines ever built in the U. S. Yet one man in an air-conditioned cab controls the entire digging operation.

To take terrific radial and thrust loads 14 Timken® tapered roller bearings are used at critical points in the crowd, main and swing machinery. Their tapered design enables them to take any combination of radial and thrust loads. The

full-line contact between rollers and races gives Timken bearings extra load-carrying capacity, too. And they shrug off shock loads; they're case-carburized to have hard, wear-resistant surfaces and tough, shock-resistant cores.

Timken bearings are geometrically designed to roll true. And they're precision-made to live up to their design. They virtually eliminate friction. And by keeping housings and shafts concentric they make closures more effective. Dirt stays out; lubricant in.

We even make our own electric furnace fine alloy steel, for extra quality control. No other American bearing maker does. For your No. 1

bearing value, specify bearings trade-marked "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



*This symbol on a product means its bearings are the best.*



# TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

## TAPERED ROLLER BEARINGS ROLL THE LOAD

## Equipment News (Continued)

as 30 microns (425 mesh). These new machines apply principles of sonic vibration to sifting and filtering and were developed in Germany. The company has more information if desired on their products which should have a wide range of applications.



### Anti-Corrosion Solution

Selby, Battersby & Co., Philadelphia, Pa., has come out with an anti-corrosion solution that can be applied without heating. Known as "Komul," this agent is an irreversible uniform emulsion of coal-tar pitch stabilized with mineral colloids. It provides excellent corrosion-preventing qualities, states the firm, and is easy to apply, with good resistance to temperature change. It contains no bentonite clay, soluble soap, asphalt, sulphite pitch or sulphonated acids. Due to its resistance to gasoline and oils, it is effective as a sealer over bituminous asphalt driveways, it is added.



### Speed Reducers

Four new Hydgrade worm gear reducers with 1/3- to 5-hp input have been announced by Foote Bros. Gear & Machine Corp., Chicago, Ill. The new units are made to combine maximum load carrying capacity with minimum center distances, states Foote. The wide-faced worm gears, which are available in sizes from 2 in. to 3 3/8 in-center distances, are made of virgin alloy bronze. The shafts are drop forged steel. Extra-strength cast iron housings insure

## HUBER-WARCO motor graders



### makes quick work of tough grading

Huber-Warco torque converter MOTOR GRADERS ranging in horsepower from 102 to 195 h.p., have been designed to efficiently handle tough haul road grading assignments. The perfect balance of weight and power permits these graders to move more volume with faster passes and smoother cuts for more profitable operation. A tail-shaft governor maintains speed regardless of load conditions . . . the power-shift transmission eliminates shifting operations. An exclusive feature of Huber-Warco MOTOR GRADERS is the completely cab-controlled hydraulic blade movement. In less than a minute, and without ever leaving the cab, the operator can move the blade from a 90° bank sloping position on one side to 90° on the other. There are NO manual adjustments to be made. In addition to the torque converter models, Huber-Warco also has a line of standard transmission graders from 75 to 123 h.p. Get all the important facts . . . contact your Huber-Warco distributor today.

A product of HUBER-WARCO COMPANY, Marion, Ohio, U. S. A.

#### HUBER-WARCO COMPANY, Marion, Ohio, U.S.A.

Send specifications on Huber-Warco motor graders.

torque converter  standard transmission  
 Send me the name of my nearest Huber-Warco distributor.

Name \_\_\_\_\_

Title \_\_\_\_\_

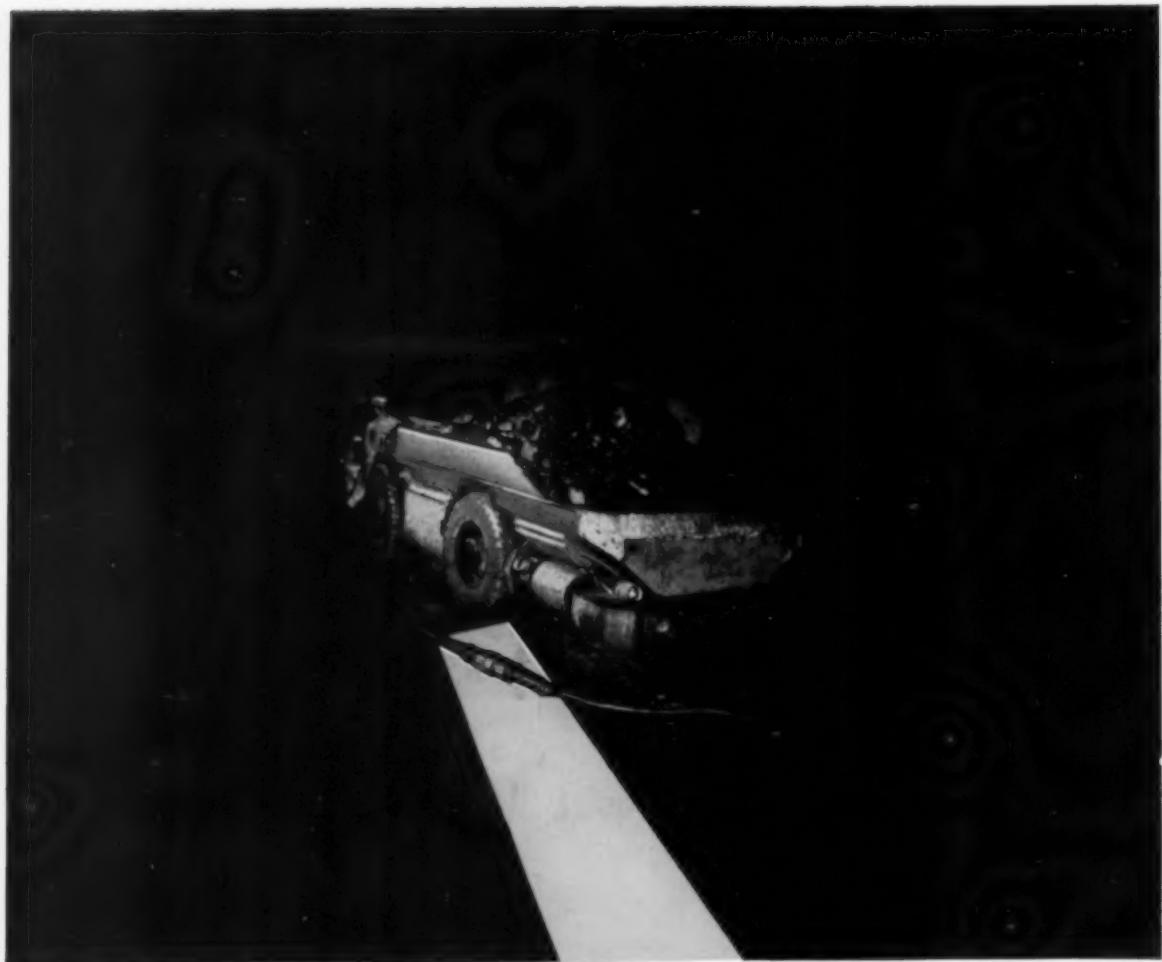
Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

S-CA





## THIS CONNECTOR HAS TO BE *Tough!*



**STRAIGHT PIN BIGUN**  
(SPB) styles are molded to 36" (Or as specified) leads. Have threaded metal couplings. Ask for Bulletin B39a.

**"QUIK-LOC"** styles attach quickly to your cable. New-type couplings engage or disengage in  $\frac{1}{4}$  turn. Ask for Bulletin B57.

**IT IS!** It's a Joy Connector . . . a non-corrodible, moisture-tight electrical coupling with a rugged coat of flame-resistant, shatter-proof, distortion-resistant Neoprene. Soak it in water, hit it with a sledge, drag it through oil . . . it'll take that and more.

Joy plugs and receptacles are built for long, maintenance-free service under the most adverse conditions. They're produced in styles and sizes to meet every need . . . for both AC and DC applications. "SPB" and "Quik-Loc" designs are available with pilot control contacts for *permissible operation* with Joy's Bureau-of-Mines-Approved distribution centers (SCC units).

For details, write Joy Manufacturing Company, Electrical Products Division, 1201 Macklind Avenue, St. Louis 10, Missouri. Executive Offices: Oliver Building, Pittsburgh 22, Pennsylvania.

**JOY** . . . EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY

OTHER  
PRODUCTS  
of the  
ELECTRICAL  
PRODUCTS  
DIVISION



Safety  
Circuit Centers



Distribution  
Boxes



Portable  
Lighting



Cable  
Vulcanizers

## Equipment News (Continued)

exact and permanent gear alignment and support for the bearing, adds the manufacturer.

### Dustless Stopper

A new rock drill known as "Vacujet" that sucks all dust and cuttings down through the drill and discharges them under pressure through a hose to a container is a product of Ingersoll-Rand Co., New York, N. Y. The manufacturer stresses that the stopper is an entirely new drill that eliminates awkward dust hoods and cumbersome vacuum lines. The line used for carrying away dust and cuttings after the drill sucks them up is an ordinary one-inch air hose and not costly vacuum-type hose. The drill steels have a tapered bit end and shank eliminating forging and heat treatment, adds the firm.

### Equipment Shorts

**OIL FILTRATION**—The advantages of full-flow oil filtration have been added to industrial and marine arrangements of two Caterpillar Series D diesel engines, reports Caterpillar Tractor Co., Peoria, Ill. The full-flow lube oil-filter system is designed to protect precision machines' internal engine parts. Increased filter capacity of the system and improved efficiency of the Caterpillar paper elements for filtering, make possible extended oil filter change periods.

**GASOLINE CANS**—New oblong-shaped gasoline filler cans are now supplied by Eagle Mfg. Co., Wellsburg, W. Va., for general use in the industrial field. They are available in one- and two-gallon sizes. The fillers are made from tinned steel and are equipped with new "spark-proof Hy-Car rubber angled spout," that eliminates any spilling of liquid from snap-back action.

**LIGHTWEIGHT HOISTS**—A new line of lightweight aluminum electric hoists has been introduced by the Coffing Hoist Div. of Duff-Norton Co., Danville, Ill. A new coil chain called "Coffic Quick-Lift" brings heavy-duty hoist performance and durability to the portable hoist field. The hoist's aluminum housing is made in sections to permit easy access to all parts. It is a simple operation to rechain the hoist or adjust the limit switch.

**PAINT HOT SURFACES**—Certified "Hi-Temp" 22 is a ready-mixed aluminum paint designed and formulated to withstand 2,200 F. It is made by United Laboratories, Inc., Cleveland, Ohio. The

## HUBER-WARCO motor graders



### keeps haul roads clear for payloads

Earth rolls off the moldboard as the Huber-Warco MOTOR GRADER quickly and efficiently performs its grading assignment. Huber-Warco MOTOR GRADERS with torque converter, tail-shaft governor and power-shift transmission make faster passes with smoother cuts . . . gives more profitable grader operation. Once the operator sets the desired speed it is maintained by the tail-shaft governor, regardless of load conditions. Operators also like the easy maneuverability and the fact that there is NO CLUTCH in the torque converter models provides a new ease of operation. An exclusive feature of Huber-Warco MOTOR GRADERS is the completely cab-controlled hydraulic blade movement for bank sloping. In less than a minute, and without ever leaving the cab, the operator can move the blade from a 90° bank sloping position on one side to 90° on the other. There are NO manual adjustments to be made. Huber-Warco torque converter and standard transmission MOTOR GRADERS range from 75 to 195 h.p. See your Huber-Warco distributor for complete details.

**A product of HUBER-WARCO COMPANY, Marion, Ohio, U. S. A.**

#### HUBER-WARCO COMPANY, Marion, Ohio, U.S.A.

Send specifications on Huber-Warco motor graders.

torque converter    standard transmission  
 Send me the name of my nearest Huber-Warco distributor.

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

S-CA





**IN THIN SEAMS ONLY THE  
Compton "Twin Head" 

---

GIVES YOU ...**

**8% More Coal Recovery**

than from any other auger

**High Hourly Production**

■ 65 T. P. H. in 30" coal

■ 85 T. P. H. in 38" coal

Reports from operators prove the efficiency of the "TWIN HEAD" auger in recovering coal from seams so thin that, until the advent of the "TWIN HEAD," they were not suitable nor profitable for auger or deep mining.

The twin heads, revolving in unison, auger a single twin hole or, where seam thickness permits, will drill double vertical overlapping twin holes to a depth of 150 feet.



*Contact Compton for your auger requirements and a free appraisal of your property for the proper auger application.*

**Compton, Inc.**  
ORIGINATORS OF COMPTON LUMP RECOVERY HEADS  
CLARKSBURG, W. VA.

WHEN LOOKING FOR AUGERS—LOOK TO  
**COMPTON**

## Equipment News (Continued)

special paint is good for those surfaces which reach temperatures in excess of 700 F because at that point a fusing action takes place and the coating is fused to the surface.

**FAST DRILLING**—Kennametal, Inc., Mining Tool Div., Bedford, Pa., reports that its RD 1-5/8 rotary drill bit stays hard while drilling fast in the hard Buck Mountain vein in Pennsylvania. The bits drill an average of 230 ft of hole before they need resharpening. This is fine performance, says Kennametal, for so hard an anthracite seam as the Buck Mountain. Even after 230 ft of drilling, asserts the company, the bits are only slightly dull, and so little carbide is removed in sharpening that the bits take about 30 regrinds.

**SCREEN CLOTH**—A new device for mounting and tensioning screen cloth on vibrating screens is announced by Hewitt-Robins, Inc., Stamford, Conn. The device, a special slotted bolt and wedge, with retaining washer and swivel washer, makes it possible to change cloth in about one-half the time required with conventional threaded bolts and lock-nuts, according to reports. A screen-cloth unit is released by a few hammer taps on the wedge, that is made of forged alloy steel, heated treated to a Brinell hardness range of 350 to 400.

**OIL SYSTEM**—“Accumite,” a new, low-cost type of miniature lubrication system for use on machine tools, offers positive displacement. Stewart-Warner Corp., Alemite Div., Chicago 14, Ill., makes the low-pressure systems which are designed to efficiently lubricate industrial vehicles and machinery previously not considered for centralized systems because of economical or structural reasons.

## Free Bulletins

**ROOF SUPPORT**—A 27-min sound color film produced by Ohio Brass Co., Mansfield, Ohio, is called “Hold That Roof!” The film is sub-titled “Suggested Installation Procedures For Safe Roof Bolting,” and uses animated cartoons and on-the-spot underground photos to explain the subject to bolting crews and production workers in simple, easily-understood terms. The film is available through O-B representatives at individual mine properties.

**PROTECTIVE COATINGS**—A 36-p publication just out from Rust-Oleum Corp., Evanston, Ill., covers the field of coating items and features actual color

chips of 102 different coatings. This colorful manual includes complete sections on surface preparation, use of primers, and finish coatings, and the availability of special custom coatings when required. Ask for Form No. 257.

**NEW TRACTOR**—Tremendous power and capacity with fast, economical operation insures peak production with complete safety. This is the theme of a brochure on Model 404 Trojan tractor shovel put out by Yale & Towne Mfg. Co., Contractors Machinery Div., Batavia, N. Y. In this 6-p, illustrated bro-

chure, Trojan features that make Model 404 operate efficiently in sand, gravel, quarry, coal stripping and other applications are discussed thoroughly. Complete specifications are given.

**HYDRAULIC SYSTEMS**—A new revision of Technical Bulletin B-4, “Hydraulic Fundamentals and Industrial Hydraulic Oils,” has been issued by Sun Oil Co., Philadelphia 3, Pa. The 44-p book is a practical introduction to the principles of hydraulic systems, with illustrated explanations of the most important types of valves, pumps, motors, tor-



## Truax-Traer Coal Company with 45-ton ATHEY PH20 Coal Haulers boost production—lower costs

The money-making performance of their first Athey-Cat PH20-DW20 Coal Haulers convinced Truax-Traer. Today they have 11 Athey-Cat rigs at their Red Amber Mine in Fulton County, Ill.

Athey-Cat Coal Haulers are profitable producers. They're built for speed—big target for fast shovel loading—35.8 MPH on the haul—quick, clean, controlled dumping. These features mean faster round trips, longer equipment life, lower costs.

See your Athey-Caterpillar Dealer for complete details. Athey Products Corporation, 5631 West 65th Street, Chicago 38, Illinois.

THE ONLY COMPLETE TRACTOR-TRAILER  
LINE . . . AND BY THE LEADERS

**Athey**

**Equipment News (Continued)**  
que converters and accessories. An explanation of important oil characteristics is followed by sections on oil selection and trouble-shooting.

**MOTOR INSULATION** — Westinghouse Electric Corp., Pittsburgh, Pa., puts out a new 12-p booklet, "Thermalastic—The Insulation System" for large motors and generators, synchronous condensers and frequency changers. The advantages of Thermalastic insulation, which extend the life of heavy rotating equipment in hard service, are presented. The booklet con-

tains a short, illustrative story on how Thermalastic insulation was developed and how it is fabricated.

**DRILL BITS** — A bulletin about one-use drill bits has been published by Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis. Bulletin RD29 illustrates bit construction, preparation of drill rod shanks, and lists specifications. Drawings and photographs illustrate the offset gage, thinner wings, and steeper reamer angle of the CRD one-use bits.

**COUPLINGS** — Victaulic Co. of America, Elizabeth, N. J., has prepared a new

6-p bulletin describing the "Vic-Easy" method of quick-coupling lightweight pipe or tubing. The bulletin details installation and operating features, explains how the use of lightweight pipe with roll-grooved ends effect substantial savings in construction and mining applications.

**DIESEL TRACTOR** — Operating advantages and engineering ideas of the Allis-Chalmers HD-6 diesel crawler tractor are described in a new 14-p catalog (M S-1251) put out by the Construction Machinery Div. of Allis-Chalmers Mfg. Co., Milwaukee, Wis. With HD-6E specifications included, this new literature release brings up-to-the-minute crawler tractor information to the reader.

**VENTILATION** — A 12-p bulletin that describes the complete line of Herman Nelson heating, ventilating and air-conditioning products, has been introduced by American Air Filter Co., Inc., Louisville 8, Ky. Bulletin 701 features AAF's new "Roll-O-Vent" automatic filter section and its adaptation to heating and ventilating units, industrial unit heaters, and air conditioning units.

**MANIFOLDS FOR GASES** — A new 20-p catalog describing the complete line of Aircro manifolds for gases has been put out by Air Reduction Sales Co., New York 17, N. Y. Catalog 829 contains specific information with illustrations regarding cylinder capacity, cylinder arrangements and dimensions along with general background information on advantages of manifolding. An important feature of the catalog is the announcement of the 8290-5100 Deluxe Stationary Duplex oxygen manifold.

**MECHANIZATION** — A new catalog on International 330 and 350 utility tractors, suggesting dozens of ways of mechanizing jobs often done by hand or by smaller tractors and equipment, has just been published by International Harvester Co., Chicago 1, Ill. The booklet covers important tractor features, including general tractor design, and illustrates special-duty equipment available for use with these tractors.

**TIRES** — Nine main factors within the control of truck owners and operators determine the degree of service that will be received from truck tires, according to the Highway Truck Tire Data Book published recently by B. F. Goodrich Tire Co., Akron, Ohio. The 42-p book lists and describes the nine factors as 1) tire selection, 2) mileage booster plan, 3) inflation, 4) loads and load distribution, 5) mechanical irregularities, 6) matching and spacing of duals, 7) tire rotation, 8) rims and 9) retread before failure. The book also suggests safety rules to follow when servicing truck tires.



# haulage capacity...

**Place:** Dante, Virginia

**Operator:** Clinchfield Coal Company

**Car Dimensions:** 21'6" (body)

Width: 7'6"

Height: 33" above rails

Weight: 8500 lbs. (empty)

**Capacity:** 335 cubic feet (level load)

442 cubic feet (crown load)

**where can you match it?**

Since 1915 —

Pioneers in  
haulage equipment



# Find the firm going places...you'll find FIRESTONES!



Whether you operate one truck or twenty trucks, you can't buy a tire that costs less per mile than Firestones. Billions of miles of carefully kept fleet records prove Firestone truck tires outwear all others.

Firestones last longer because Firestones are built better. Take Firestone S/F—Safety-Fortified—cord. Firestone tempers cord, but doesn't stop there. Firestone gum-fortifies every fiber for a permanent lock between rubber and cord, measures every individual ply with electronic precision.

The result is extra miles, lower cost per mile for every user of Firestone truck tires with S/F—Safety-Fortified—cord. Every Firestone truck tire is an outstanding value in long-wearing, dependable performance. No wonder more going concerns go on Firestones! See your local Firestone Dealer or Store for truck tires or truck tire service.

YOU CAN'T BUY A TIRE THAT COSTS LESS PER MILE THAN FIRESTONE

Copyright 1958, The Firestone Tire & Rubber Company  
Enjoy the Voice of Firestone every Monday evening on ABC television



**Firestone**  
BETTER RUBBER FROM START TO FINISH



This Barber-Greene underground mine conveyor is operating in the heart of West Virginia's bituminous field.  
Send for 192-page catalog describing the full Barber-Greene standardized conveyor line.

## Lengthen easily — a cost-cutting advantage of Barber-Greene conveyors

Now 2000 feet long from face to portal, this Barber-Greene conveyor has already been extended several times. And it will be lengthened many more times before the deposit is worked out. The easy lengthening of Barber-Greene underground mine conveyors is just one of the many advantages of Barber-Greene standardization.

These advantages are:

**Faster delivery.** Packaged units come from dealer stock or are immediately available from the factory.

**Low-cost erection.** Conveyors get into operation sooner, with big savings in engineering costs.

**Unmatched flexibility.** Interchangeable parts simplify lengthening or shortening of conveyors to meet changing needs.

**Parts availability.** Repair parts can be shipped from stock—usually from the local distributor's stock.



Literature on request.

58-2-PEU

**Barber-Greene**

AURORA, ILLINOIS, U.S.A.



CONVEYORS...LOADERS...DITCHERS...ASPHALT PAVING EQUIPMENT



*"Because of outstanding performance,"*  
says J. B. Rich, Pres.—

**"Gilberton Coal's  
electric-powered  
excavators use  
General Electric  
systems—exclusively"**

**"One shovel has operated 6000 hours  
with only routine maintenance"**

Gilberton Coal Company is a fast growing firm mining a rich anthracite coal vein in eastern Pennsylvania. Because Gilberton has received dependable, continuous operations from General Electric equipped shovels and draglines, all their electric-powered excavators now utilize G-E motors and control.

**General Electric Engineers** work closely with shovel and dragline manufacturers to carefully match all characteristics of electrical amplidyne control, motors, and generators with those of the shovel or dragline. This co-ordinated electrical-mechanical design results in rugged, rapidly

responding machines like those setting performance records at Gilberton Coal Co.

**What's more**, in quarry and mining areas throughout the nation, you will find G-E renewal parts distributors and complete, efficient, around-the-clock service from near-by General Electric Service Shops.

**When You Plan** to purchase an electrical excavator for your mining operations, specify a machine powered and controlled by General Electric system-engineered equipment. Write Section 663-49, General Electric Co., Schenectady, N. Y.

**Engineered Electrical Systems for the Mining Industry**

**GENERAL ELECTRIC**



**32-YD WALKING DRAGLINE** takes a 50-ton bite of overburden, dumps it, and swings back for another—*every 50 seconds*. Tremendous power (4950 hp) and precisely responding controls regulate this performance. Heart of the G-E electrical system in this Bucyrus-Erie dragline is the 1500-hp synchronous motor and 600-hp induction motor driving generators which feed d-c power to drag, hoist, swing and walking motors. The dragline operates 130 hours per week, year 'round.

# Among the Manufacturers

## Sells Assets

Le Roi Div., Westinghouse Air Brake Co., has sold the assets of its engine business to Waukesha Motor Co.

Le Roi's line of internal combustion engines along with certain inventories, special tools and equipment, make up the major assets of the transaction. No financial consideration was disclosed for the agreement that became effective April 1. A spokesman for Le Roi has stated that the move will permit the division to concentrate its efforts on the air compressor and tool business in order to gain a greater share of the market in this field.

## Division Move

Bucyrus-Erie Co. transferred most of its drill division activities from South Milwaukee to its new plant in Richmond, Ind., during April.

The South Milwaukee plant will stop stocking and mounting drills, parts service and bit dressing. It will continue repair service for drilling tools, however. Preliminary manufacturing operations at

Richmond have already begun. Blast hole drills will be the first machines assembled.



## Recent Promotion

Howard Goodman has been elected president and chief executive officer of Goodman Mfg. Co.

He succeeds William E. Goodman who

will continue as chairman of the board of directors. Both men, sons of the founder of the 58 yr old mining machinery firm have long been with the business. Since 1939 Howard Goodman has been executive vice president and William Goodman has served as president. Both have paralleled company activities with a serving interest in the progress and growth of the mining industry. Other changes in Goodman Co. have also been announced. L. S. Ahlen and W. H. Carson have been promoted to the main office in Chicago from district managements at Terre Haute, Ind., and Huntington, W. Va. Both will serve as assistant sales managers, Ahlen for mining machinery and Carson for machinery supply parts.

## New Acquisition

National Mine Service Co. has acquired the 38 yr old Greensburg Machine Co.

Greensburg Machine, located in Greensburg, Pa., will be operated as the Greensburg division of National Mine that produces equipment for mining. Greensburg

**LINATEX**  
LASTS LONGEST

LINATEX DOUBLES AND TRIPLES CONVEYOR BELT LIFE

LINE WITH LINATEX

LINATEX HAS UNEQUALLED ABRASION RESISTANCE FOR:

- Transfer Chutes
- Feeder
- Skirt Boarding
- Belt Wipers
- Pulley Lagging
- Return Idlers

COLD BONDING PROCESS — JOB SITE APPLICATION

**LINATEX CORP. OF AMERICA**  
P.O. DRAWER "D", STAFFORD SPRINGS, CONN.

**NO CONCRETE PIT!**  
*Easiest to MOVE!*

**PORTABLE TRUCK SCALES**

Engineered for rugged use in the field. Low initial cost, no maintenance. Can be used as PITLESS SCALE saves on pit costs.

CAPACITIES: 20 to 52 tons. DACK LENGTHS 18 to 43 ft.

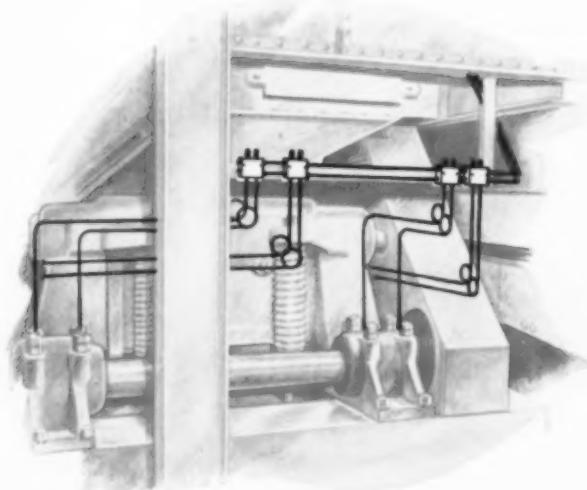
OTHER THURMAN SCALES: Pit • Warehouse • Industrial • Liquid Weighing • Wheelbarrow • Batching • Automatic

Precision Scales since 1918

**THURMAN**  
SCALE COMPANY

156 N. 5th St. Dept. CA-7 Columbus, Ohio

# Saving on lubricant alone is \$1200 a year with Farval



**FARVAL—Studies in  
Centralized Lubrication**  
No. 97

A COAL company faced a serious lubrication problem in one of its tipples. It seemed impossible to find a lubricant that would stay in the crusher, shaker screen and washer bearings, especially in the eccentrics, between visits of the oiler. As a last resort they were using a special, very heavy grease costing  $13\frac{1}{2}$ ¢ a pound, and still the oiler had to go around to renew it every hour. As the tipple was operating 24 hours a day, 6 days a week, the cost of grease alone was running more than \$200 a month.

Then they decided to try a Farval Automatic Centralized System of Lubrication to serve the 295 bearings on the tipple. With Farval they could deliver an accurately measured quantity of grease to each bearing regularly and as often as necessary. Experience soon demonstrated a 30-minute interval to be best. Not only did Farval reduce the amount of lubricant consumed but it was also possible to switch to a standard grease, resulting in a saving of 50% on lubricant cost alone.

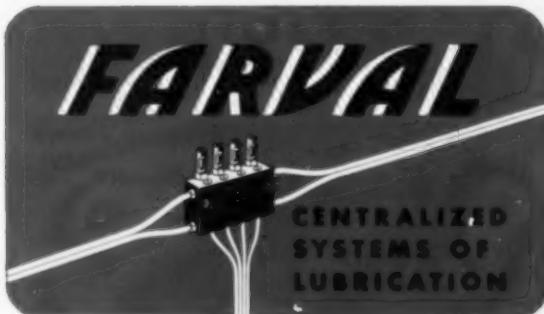
Actually, the saving on lubricant was small compared to the saving in labor, the reduction in bearing replacement expense, and the elimination of frequent shutdowns and interruptions to production experienced previously, due to faulty lubrication.

Farval Centralized Lubricating Systems have been serving the coal industry for more than 27 years. In preparation plants, Farval lubricates Feeders, Crushers, Conveyors, Shakers, Vibrating Screens, Elevators, Washers, Jigs, Dryers, Mixers, Loading Booms and Drives.

Farval is the Dualine System of Centralized Lubrication, with the Positive Piston Displacement Valve. This valve has but two moving parts and is fully adjustable, with a Tell-tale indicator at each bearing to show the job is done.

Write for Bulletin 26 for a full description of Farval. The Farval Corporation, 3288 East 80th Street, Cleveland 4, Ohio.

*Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.*



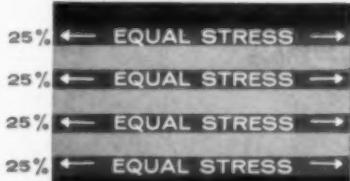


**BBC** — Balanced Belt Construction — is BOSTON'S exclusive manufacturing method that equalizes ply stress so that each ply pulls its full share of the load . . . eliminates lazy plies.

This is the result of two advanced BOSTON processes; *Electro-Tensile Control*, which controls ply tension — and *Rotocure*, the only continuous method of vulcanization which assures uniformity throughout the belt.

New DULON Covers add further uniformity and durability to BOSTON belts. With DULON, the consistency of belt performance has been greatly increased. DULON has proven, on the job, that it is amazingly resistant to abrasion, gouging and tearing.

Let the BOSTON man present the dramatic proof about Balanced Belt Construction with DULON Covers — as it applies to your specific belt problems.



**BOSTON**

BOSTON WOVEN HOSE & RUBBER COMPANY  
 DIV. OF AMERICAN BILTRITE RUBBER CO., INC.  
 BOSTON 3, MASS.



INDUSTRIAL HOSE



BELTING



V-BELTS



PACKING



MATTING



TAPE

# Euclids are PACE-SETTERS for PROFITS

For coal stripping operations Euclid Rear-Dumps and Bottom-Dumps rate high in keeping overburden and coal hauling costs low. Their ability to stay on the job month after month, with less down time for servicing and repairs, has made "Eucs" the first choice of leading mine operators. Have your nearby Euclid dealer make a production and cost estimate for your operation . . . there's no cost or obligation, and there's a good chance that he can show you how to cut your hauling costs.



• Rear-Dump Euclids, of 10, 15, 18, 22, 40 and 50 ton capacities, are powered by diesel engines of 128 to 600 h. p. With standard 5 or 10 speed transmission, or with Torqmatic Drive, they have a range of travel speeds up to 36 m. p. h. with full payload. These "Eucs" are unequalled for performance and low operating cost on the toughest jobs. No matter what your off-the-highway hauling requirements may be, there's a Euclid model that can haul more loads per hour at lower cost per ton or yard moved.

• Bottom-Dump Euclid Coal Haulers are designed and built as complete units . . . they have good power-to-weight ratio and proper weight distribution for traction and ease of handling. Short wheel base of tractor and universal hitch design permit short turns and make these big "Eucs" easy to handle. Large single or dual tires on tractor drive and trailer wheels provide good traction and flotation. Powered by 218 to 360 h. p. engines, with 5 or 10 speed standard transmission or with Torqmatic Drive, these Coal Haulers have capacities of 25, 40 and 51 tons.



EUCLID DIVISION GENERAL MOTORS CORPORATION,  
Cleveland 17, Ohio



## Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE



**There is a  
difference  
in Resistors**



**Resistors have proved  
this for many years**

Different, because steel and mica, both extremely durable materials, coupled with P-G exclusive design produce a resistor of great mechanical strength. There is nothing to break. With accurate resistance values and adequate carrying capacities, P-G Resistors outlast ordinary resistors. Tell us your specifications and let P-G solve your resistor problem.

For any job . . . Where constant "trouble free" resistor service is wanted . . . you can safely specify P-G Steel Grid Resistors and get better performance with low cost maintenance.

*The Nonbreakable Steel Grid Resistor*



**THE POST-GLOVER ELECTRIC COMPANY**

OFFICE and FACTORY—Kenton Lands Road, Erlanger, Kentucky

MAILING ADDRESS—Box 709, Covington, Kentucky

#### Manufacturers (Continued)

has manufactured and shipped storage-battery locomotives to major coal and metal mines of this country and to mines and tunnel construction projects in Central and South America, Canada, Europe and Africa.

#### Controlling Interest

Mine Safety Appliances Co. of Pittsburgh has purchased a controlling interest in the Auergesellschaft Aktiengesellschaft Auer Co., Inc., one of Europe's leading manufacturers of safety equipment.

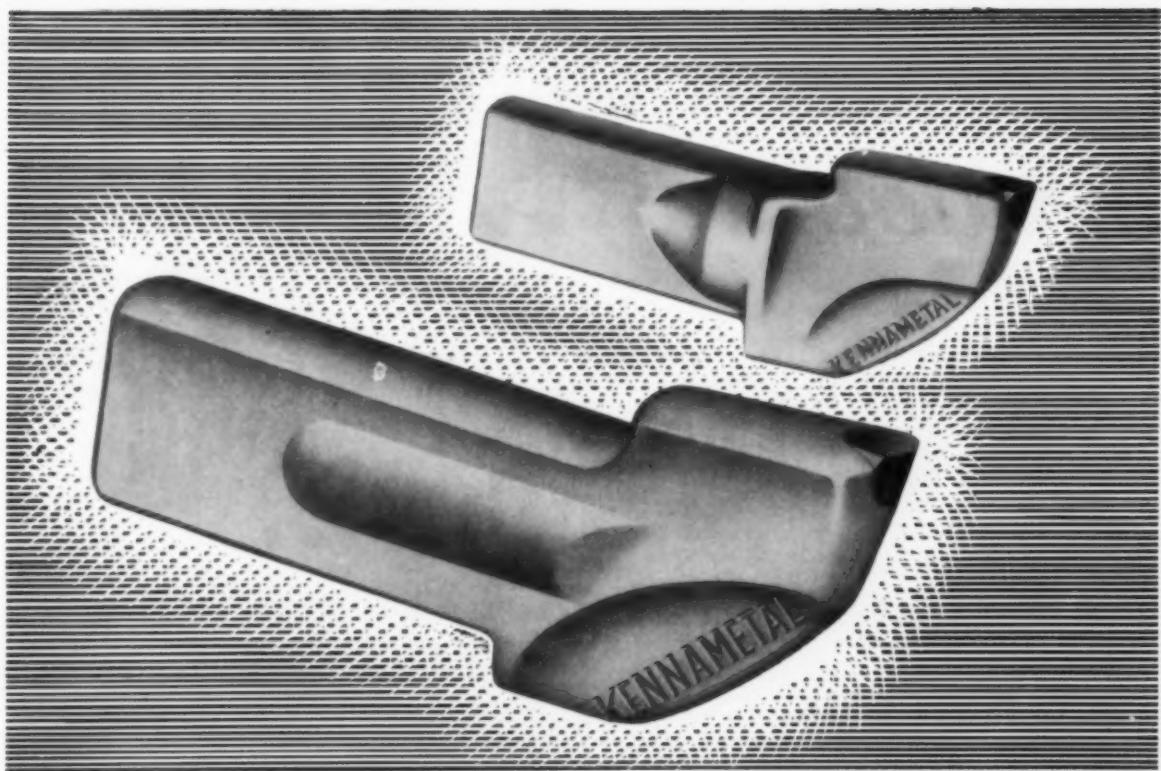
Mine Safety is said to be the largest maker of safety equipment for mines and industry. Auergesellschaft manufactures a complete line of gas masks, carbon monoxide and dust respirators, inhalators and oxygen breathing apparatus. Last year MSA Co. established new subsidiaries in Mexico and Venezuela, and for many years it has operated such branches in Canada, Scotland and South Africa.



The Hulbert Oil & Grease Co., Philadelphia, Pa., specialist in the manufacture of coal-mine lubricants, has appointed Sheldon Jones as its eastern sales manager.

Mr. Jones, his wife and son—all native Pennsylvanians—will soon make headquarters in Pennsylvania. Mr. Jones received his B.S. in mining from Penn State University in 1936. For seven years thereafter, he worked with the Monroe Coal Mining Co., Revloc, Pa., starting as a coal loader and man of general work, and then progressing to engineer, fire boss, and face boss. During these years Mr. Jones passed the required Pennsylvania examinations for fire boss, assistant mine foreman first grade, and mine foreman first grade.

During the following three years, Mr. Jones was associated with du Pont in western Pennsylvania, West Virginia, and



Kennametal cutter bits with stronger shanks  
for today's higher powered mining machines.

Next time the going gets rough...

## Try these two NEW Kennametal\* Cutter Bits

Using standard bit blocks, the new U7B Series, shown in the foreground above, quickly and economically reduces shank breakage in hard cutting sections. Reinforcing ribs on both sides of the shank fit the center hole of most bit block designs and provide the added shank strength required to resist side thrust.

Kennametal offers the rugged U3 Series for *extreme* cutting conditions, where hard impurities are encountered frequently and maximum bit strength is required. Special Bit Blocks to fit the U3's greatly increased cross sectional area are now available.

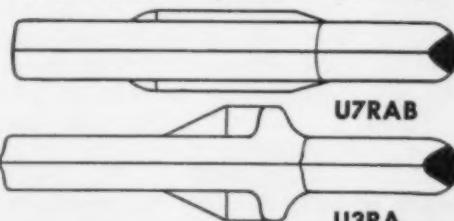
Actual mine testing, in problem areas, has proved that both of these bits keep cutting coal where other bits fail.

Forged from highest quality steel, the added shank cross section provides the strength required to stand up in difficult cutting areas under the high power of today's mining machines.

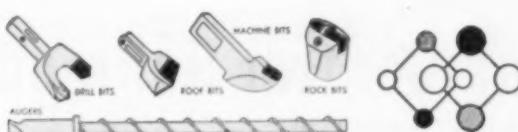
Get more information on the latest of "The Yellow Bits" from your Kennametal Representative. You'll find his name listed in the Classified Section of your Telephone Directory under "Mining," or write KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

\*Trademark

Increased cross section provides increased strength



2 GOOD TIPS—Both Kennametal U3 and U7B Bits are available with these popular tips.



INDUSTRY AND  
**KENNAMETAL**  
...Partners in Progress

# *needed...* 4,000 tons of coal a day...

and New York  
Central's coal fleet  
gets it there on time  
for Public Service of  
New Jersey



New Bergen Generating Station of Public Service of New Jersey has been designed for coal—will require 4,000 tons a day when installation is completed.

Dependable service to the nearly 1½ million electric customers of Public Service of New Jersey will be greatly augmented and enhanced by completion of its ultramodern Bergen Generating Station. This new generating station is located for prompt delivery of coal by New York Central's coal fleet.

At full load, the Bergen Generating Station, which has been designed for coal, will require 4,000 tons of bituminous coal a day to deliver 3,800,000 pounds of

steam per hour. New York Central's fleet of nearly 41,000 coal cars—including more than 5,000 new 70-ton hoppers—is ready today, to take this important, new requirement for coal in stride, as well as the additional coal requirements of a number of other electric utility plants served by the New York Central which are presently adding generating units to their plants.

Rapid, efficient transportation and handling of coal have been an important objective of New York Central's long-

range expansion program. For this fall's coal stocking program, for any shipment requirements you may have—now or in the future—depend on New York Central for prompt delivery.

For help in meeting your particular coal requirements or in solving your coal-burning problems, write or contact Coal Sales Managers of the New York Central Railroad. They are conveniently located in Chicago, Cincinnati, Cleveland, Detroit, New York and Pittsburgh.

## New York Central Railroad

*Route of the "EARLY BIRDS"—the one-day faster freight service*

# No welding necessary



## just drill, then hammer



## Tigerweld Wedge-Type Bonds



Drill two holes, insert the terminals, hammer in the wedge — your Tigerweld Wedge-Type Bond is installed. There is no precision drilling or welding to do. To remove them, drive out the wedge. They can be reclaimed and used again and again.

Although it takes but a few minutes to install, the Wedge-Type Bond is built to last. The solid steel wedge holds the bond firmly in place and prevents dislodging by heavy vibration and derailments.

*USS and Tigerweld are registered trademarks*

These bonds are ideal for temporary track because they can be installed easily and used repeatedly. Yet they are so durable that many mines use them on permanent trackage.

**NEW CATALOG**—Our latest catalog gives full details on all Tigerweld Power Bonds. Write today: American Steel & Wire, Rockefeller Building, Cleveland 13, Ohio.



American Steel & Wire

Division of



United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, Distributors Abroad

### Manufacturers (Continued)

eastern Kentucky where he demonstrated mine explosives.

In 1946 Mr. Jones joined Socony Mobil as lubrication engineer, devoting his main attention to coal mine lubrication problems. He subsequently served as an industrial lubrication representative for three years in the coal fields of central Pennsylvania and six years in the southern Illinois coal area.

While in Pennsylvania, Mr. Jones was active in mine safety, serving as president of the Ebensburg Holmes Safety

Council for two years and as secretary of the Central Pennsylvania Safety Association. For the past four years he has been secretary of the Illinois Society of Coal Preparation Engineers & Chemists. He has been a member of the executive board of the Mining Electrical Group of southern Illinois for the last three years. He is also a member of the Illinois Mining Institute, American Institute of Mining, Metallurgical & Petroleum Engineers, and National Mine Rescue Association.

D. A. Haley has been appointed man-

ager of a newly created Electrical Div. for Industrial Engineering & Construction Co., Inc., Fairmont, W. Va.

An electrical engineering graduate of West Virginia University, Mr. Haley had been associated with National Potash Co. in Carlsbad, N. M., in the design and development of their new mine and refinery and prior to that he was with Jamison Coal & Coke Co. in the electrical design and development of several coal cleaning and preparation plants.

Marion Power Shovel Co. announces the appointment of Ralph W. Kerr as assistant to M. V. Cornell, vice president, large machine sales.

Mr. Kerr joined the company in 1948 after graduating from Ohio State University with a degree in industrial management. He had been assistant service manager, sales representative and district sales manager for MPS before he left in 1955 to operate and manage a stone quarry in Sidney, Ohio. He returned to Marion Power Shovel Co. last November.

Douglas E. Newton has been appointed product manager with Western Machinery Co. in San Francisco.

Mr. Newton, with experience in metallurgical engineering, will specialize in applications involving flotation, classification, conditioning and other processing. He is a graduate of the Colorado School of Mines and has also studied civil engineering at the University of South Carolina.

Fairmont Supply Co., a large distributor of industrial supplies for mines and industry, has announced the election of Curran Cavanagh as president of the firm.

Mr. Cavanagh, who has been vice president of Fairmont since February, 1947, succeeds J. M. Knowles, who retired. The new president had experience in civil engineering and the mining field since his graduation from George Washington University with a master's degree in engineering. He belongs to the Coal Mining Institute of America.

Bruce Mayo is the new district manager of Link-Belt Co.'s Birmingham district office.

Mr. Mayo studied engineering at the University of Tennessee and joined Link-Belt Co. at the Caldwell plant in Chicago in 1945.

T. L. Mellish is the new manager, parts sales, for the Construction Machinery Div., Allis-Chalmers Mfg. Co.

He has been assistant manager since February, 1956. Prior to that he was in parts sales at the Springfield, Ill., works, where he joined the firm in 1936. He is a native of Thayer, Ill.

## Now... More Than Ever!

You need the SAVINGS  
AT THE LOADING POINT that only  
STAMLER Car Spotters can give you!

You can load more coal...faster...more efficiently...and at less cost with STAMLERS than with any other equipment available.

IT'S always wise to keep an eye on costs but there's no time like right now to take a second look. How are you doing at the loading point? Are you loading your maximum amount of coal with efficiency? Are you sure you know just what your maximum efficiency is?

It has been our experience that when STAMLER Car Spotters go IN . . . loading efficiency goes UP. And costs go DOWN! A new concept evolves as to just how much coal should and can be loaded. A new maximum is established. It's a matter of record and you can check the record at any mine where STAMLERS are operating.

The point is simply this:— with STAMLER Car Spotters you can load more coal . . . faster, more efficiently and at lower cost than by any other method.



**W. R. STAMLER CORPORATION**  
**PARIS, KENTUCKY**

SCHROEDER BROTHERS, Exclusive Eastern Sales Agent  
Pittsburgh, Pennsylvania  
UNION INDUSTRIAL CORP., Carlsbad, New Mexico  
SALMON & CO., Birmingham, Alabama  
WESTERN SALES ENGINEERING CO.,  
Salt Lake City, Utah



This Model TD Rear Dump Euclid offers a 10-speed Fuller 10-F-1220 Transmission.



A 5-speed Fuller 5-F-1220 Transmission gives rugged dependability to this Euclid R-18 Rear Dump Truck.



This Euclid S-12 Hydraulic Scraper is powered through a 5-speed Fuller 5-F-1220 Transmission.

## Geared by FULLER . . .

For heavy-duty earthmoving and mining equipment, leading manufacturers standardize on Fuller Transmissions . . . for these good reasons:

Fuller Transmissions are designed and built for long, trouble-free service under the most severe operating conditions. These heavy-duty transmissions provide smoother shifting,

longer engine life and the right gear ratios for the job . . . all performance features that add up to faster work cycles and greater profits for Fuller Transmission users.

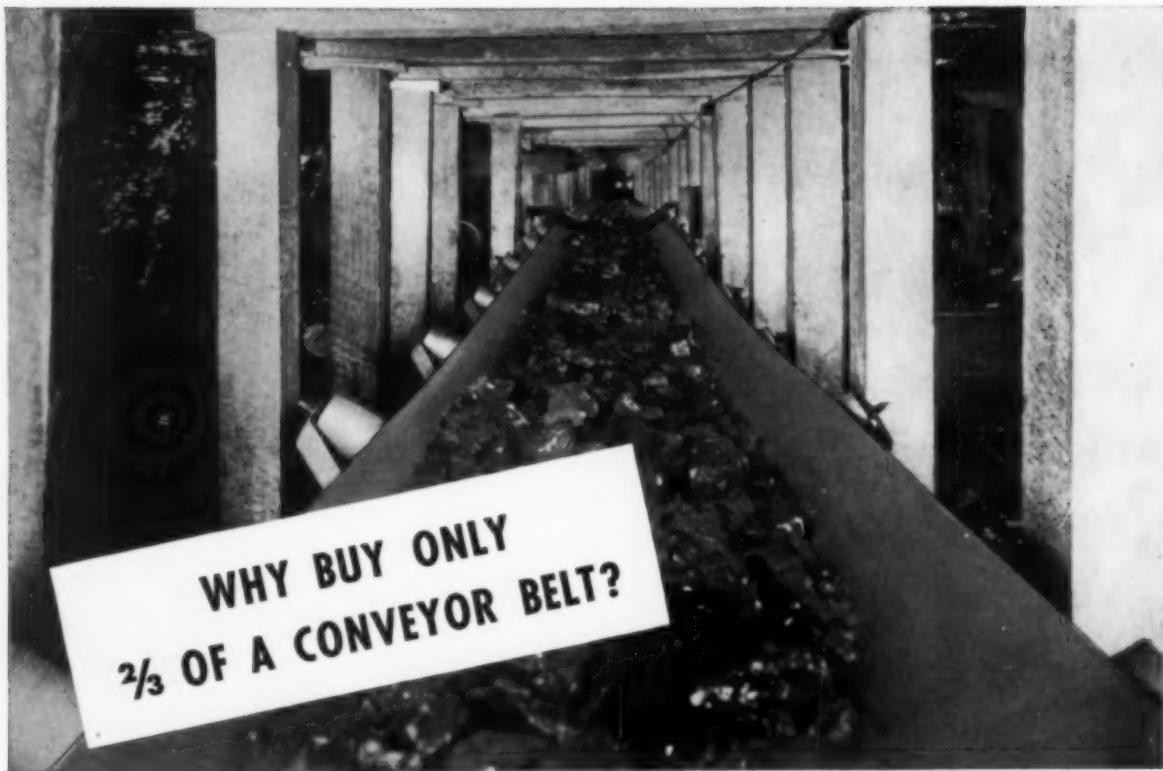
From more than 100 models available for rubber-tired equipment, you'll find a Fuller Transmission de-

signed to do your job better . . . and at lower-than-ever operating cost.



FULLER MANUFACTURING CO., Transmission Division • Kalamazoo, Mich.

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.



## FIRE RESISTANT RAY-MAN CONVEYOR BELT HANDLES HEAVIER LOADS LONGER

It's the *last* one-third of conveyor belt life that determines its *true* and *final* cost to you. That's why every component of Ray-Man Conveyor Belt is precision proportioned to assure better belt balance where it pays off most for you — in longer belt service life on your installation!

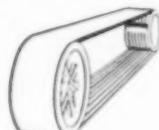
Ray-Man Conveyor Belt trains *naturally*, troughs *easily* . . . handles fuller, heavier loads even where small pulleys are required in low-head room operations. Special cushioned strength members and double compensation to relieve outer ply stress provide impact resistance *plus* exceptional flexibility.

Ray-Man requires no breaker strip . . . holds fasteners and resists gouging, tearing and ripping better than other constructions. R/M's exclusive "XDC" Cover adds additional protection against wear, tear, cuts and abrasion never before possible. Ray-Man Conveyor Belt is mildew-proof, moisture-resistant and available now in special construction with Bureau of Mines' acceptance designation: "Fire Resistant, U.S.B.M. No. 28-10."

You can't use a *safer*, better handling — *longer lasting* belt for underground mining operations. Let an R/M representative show you how these features add up to "More Use per Dollar" when you specify Ray-Man Conveyor Belt or other feature constructions . . . extra-cushioned Homocord, R/M Tension-Master for extra long slopes and high tensions. Write today for Bulletins.

### MORE POWER IN LESS DRIVE SPACE

**R/M**  
**Poly-V®**  
**DRIVE**



Patented new belt drive concept for heavy duty application. Eliminates V-belt matching problems. Delivers up to 50% more power in the same space as regular V-belts — or equal power in less space! Write for Poly-V® Drive Bulletin #6638.

®Poly-V is a registered Raybestos-Manhattan trademark.

BELTS • HOSE • ROLL COVERINGS • TANK LININGS • INDUSTRIAL RUBBER SPECIALTIES



MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY  
**RAYBESTOS-MANHATTAN, INC.**

Other R/M products: Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

# **the toughest** **roof auger** **made!**

**the new** **CARDOX**

**HEAT-TREATED ALLOY-STEEL AUGER**  
**outlasts all others 2 to 1 or better . . .**

Here is an auger built to perform under the most difficult drilling conditions.

The new Cardox roof auger is really made to take it. Shaft and flight are of toughest alloy steel, perfectly welded, then heat treated for maximum strength and maximum resistance to abrasion. One extra pitch of flight is added at the shank end for additional strength at point of greatest stress.

When we say it outlasts all others, we mean it. Tests under the most severe conditions have proved this new Cardox auger makes an immediate and substantial reduction in auger costs wherever it is used.

The new Cardox roof auger is made in any length from 10" up, with all standard shanks. Write today for a demonstration by one of our field engineers.

**CARDOX**  
can meet  
all your  
drilling  
requirements.

**AUGERS—**  
1 1/4" to 48"  
in diameter

**BITS—**  
carbide tipped  
or replaceable



Our field engineers are available to help you  
with any drilling problem.

**CARDOX CORPORATION • 307 N. Michigan Avenue, Chicago 1, Illinois**

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and DISTRICT  
OFFICES**

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Clifford 3-4812

**St. Clairsville, Ohio**  
Box 41  
Phone: St. Clairsville 619

**Louisville, Colorado**  
Phone: Boulder  
Hillcrest 2-7298

**Camden-on-Gauley, W. Va.**  
Phone: Camden-on-Gauley 2181

**Benton, Illinois**  
Box 537  
Phone: Benton 8-3821

**Pikeville, Kentucky**  
Route 2, Box 571  
Phone: Robinson Creek 53

**Library, Pennsylvania**  
Box 427  
Phone: Tennyson 5-6910

**Evansville, Indiana**  
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Phone: Harrison 2-8944

**Ottumwa, Iowa**  
Phone: Ottumwa  
Murray 4-6564



**NEW SPEED AND DRILLING ECONOMY  
WITH THE NEW IMPROVED**

**Parmanco**  
MODEL CD-51-57

**COAL AND CLAY DRILL**



- Augers Rotated by Vickers 21.5 H.P. Fluid Motor with Hydraulic Feed Finger Tip Controlled
- Cutting Shield And Guide Completely Automatic
- Drill Powered By 65 H.P. Water Cooled Motor.

Jack Foehrer, Pit Foreman says

"THE PARIS DRILL IS THE BEST WE HAVE EVER USED."

SEND FOR COMPLETE DETAILS

**PARIS MANUFACTURING CO.**

**PARIS, ILLINOIS**

### **CONTRACT CORE DRILLING**

**EXPLORATION FOR MINERAL DEPOSITS**  
INCLUDING URANIUM & LIMESTONE — ANYWHERE

**FOUNDATION TEST BORING • GROUT HOLE DRILLING**

Skilled crews and complete stock of core drills  
and accessory equipment maintained at all times

Core Drill Contractors for more than 60 years

**JOY MANUFACTURING CO.**

Contract Core Drill Division

MICHIGAN CITY, INDIANA

### **Manufacturers (Continued)**

J. N. Mason has been named president of Boston Woven Hose & Rubber Co.

Mr. Mason came to Boston Woven Hose in 1953 to organize and head up its Research & Development Dept. In December, 1953, he was elected vice president of Manufacturing & Development and became executive vice president in 1955. He had previously been vice president of O'Sullivan Rubber Corp. of Winchester, Va.

C. B. Hunt & Son, Inc., manufacturers of "Quick-As-Wink" air and hydraulic control valves and pressure specialties, has announced the election of Kenneth H. Meyer as vice president.

Mr. Meyer has been with Erie Forge & Steel Co. and served in the Air Force during World War II. He is a graduate of Case Institute of Technology.

William A. Reich has been appointed manager of the engineering section of General Electric Co.'s Metallurgical Products Dept., in Detroit.

Formerly manager of advance engineering, Mr. Reich has specialized in the fields of powder metallurgy, high-temperature alloys and non-ferrous casting.

Mine Safety Appliances Co. announces the appointment of James C. Sheehan as sales engineer at Knoxville, Tenn.

Mr. Sheehan received a bachelor of electrical engineering degree at Georgia Institute of Technology in 1949. He served in the U. S. Army as a radar specialist from 1941 to 1946.

John A. McCormick has been named manager of system sales for two-way radio units made by the General Electric Communication Products Dept.

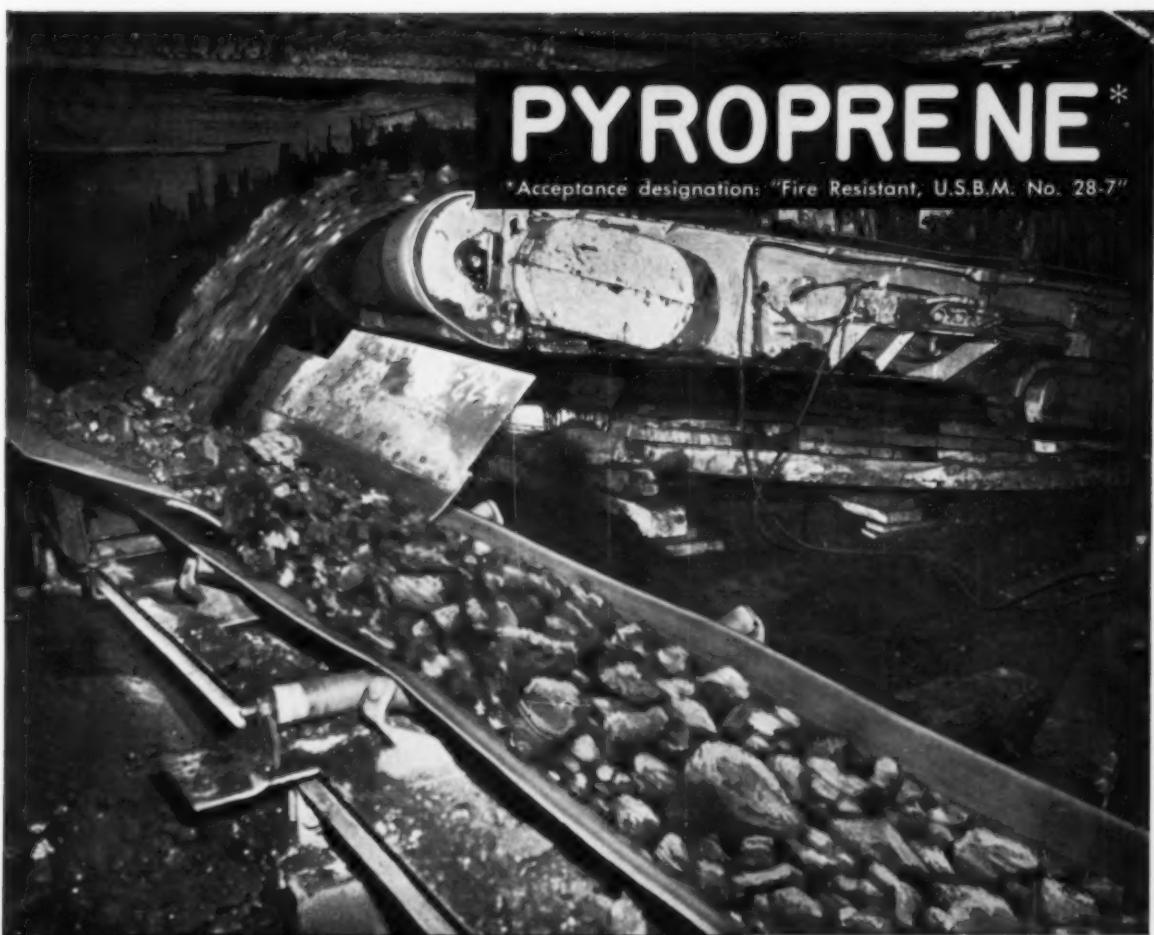
Mr. McCormick has had 30 yr of experience and has been with G.E. since 1936.

Joy Mfg. Co. (Canada) Ltd., subsidiary of Joy Mfg. Co., has announced changes in management.

James A. Drain, formerly president, has been elected chairman of the board, and D. W. M. Ross has been elected to succeed Mr. Drain as president. Mr. Drain, also vice president and general manager of the Mining and Construction Div. of the parent company, returned to the United States from Canada to assume his present position in 1956. He was retained as president of the Canadian subsidiary until the aforementioned changes were made at a recent meeting of the Board of Directors. Mr. Ross, prior to his association with Joy, worked in mining fields on several continents. He joined the Joy organization in Canada as a branch manager in Calgary, Alberta.

# PYROPRENE\*

\*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-7"



## Ten ways a Pyroprene belt will increase safety and service

A conveyor belt's resistance to fire is of prime importance—but important, too, is its ability to outlast severe service conditions, haul maximum tonnage with no time lost for repairs and replacements. Pyroprene belting has this ability to convey more coal at less cost because it is built to combat mine service hazards.

1. Pyroprene belting resists fire
2. Will not support combustion
3. Not affected by oil or grease
4. Withstands crushing impacts
5. Repels moisture
6. Resists mildew
7. Resists abrasion
8. Resists cutting
9. Resists ripping
10. Resists gouging



## Hamilton Rubber

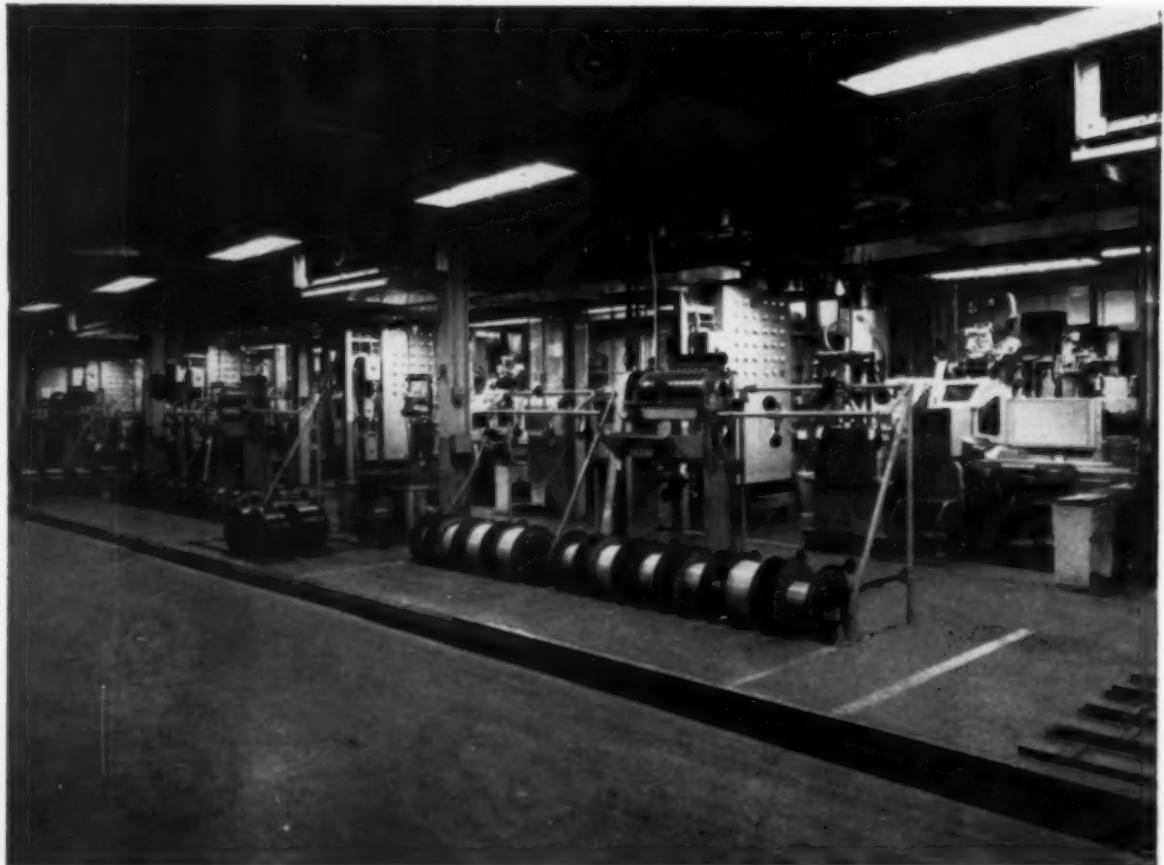
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A view of the fully automatic assembly line at Pompton Lakes, N. J., where Du Pont Electric Blasting Caps, both regular and delay, are completely assembled by electronically-operated machinery.

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**to assure you even more uniform, more reliable products**

Here, in the only factory of its kind, Du Pont Electric Blasting Caps are now made on fully automatic machinery to give you the utmost in reliability, uniformity, and dependability.

Every step in the process, from automatically loading the shell (and inspecting it 3 times during loading alone), to applying the shielded shunt and paper band is electronically controlled.

This revolutionary approach means that every Du Pont Electric Blasting Cap—regular or de-

lay—*must* meet our rigid standards at *every step* or it will be automatically rejected by one of the dozens of electronically controlled “watchmen.”

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more uniform, more reliable, more dependable than ever before.

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### **DU PONT BLASTING CAPS**

*Products of Du Pont Research*



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... THROUGH CHEMISTRY**

Downtime  
costs a lot  
more  
these  
days.....

You have a lot less  
downtime with the

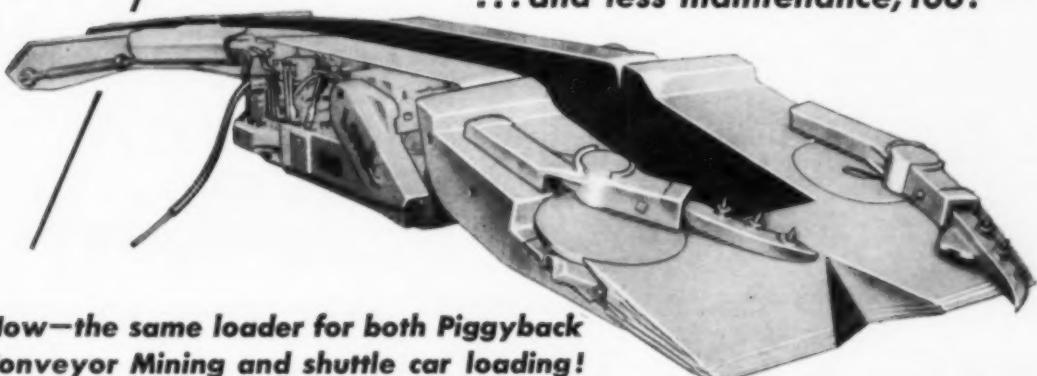
**LONG**

Model 188-D

\*

**PIGLOADER**

*...and less maintenance, too!*



**Now—the same loader for both Piggyback  
Conveyor Mining and shuttle car loading!**

With its counter-balanced head and swing boom, the LONG 188-D is specifically designed to work with Piggyback\* Mining as well as with shuttle cars. The swing boom feature is an advantage in most Piggyback applications and permits greater versatility with the same loader—even permitting the use of Piggybacks and shuttle cars on the same section.

Time studies prove that the 188-D outperforms any loader for shuttle car loading. Its 25½-inch height makes it the lowest, high capacity loader on the market. Its unique head design, with flat digging angle and recessed digging arms, permits lifting the head as much as 10 inches off the mine bottom without the stroke of the digging arm exceeding the overall height of the machine. This recessed arm feature has an important effect on actual working height, since in other designs the rear stroke of the gathering arms projects above the overall height of the machine.

In the straightforward, simplified design of the 188-D, there are only a fraction as many control and mechanical parts as in ordinary loading ma-

chines. For example, there is only one main speed reducer (instead of four) and only one motor and control. The single 40 horsepower compound wound motor, unlike smaller series wound motors, maintains speed and loading rate in toughest going.

The result—the LONG 188-D is easier to understand; operation is more efficient with less downtime and maintenance; you save on spare parts inventory; upkeep is simplified and easier to perform.

**And you get all these  
advantages to boot!**

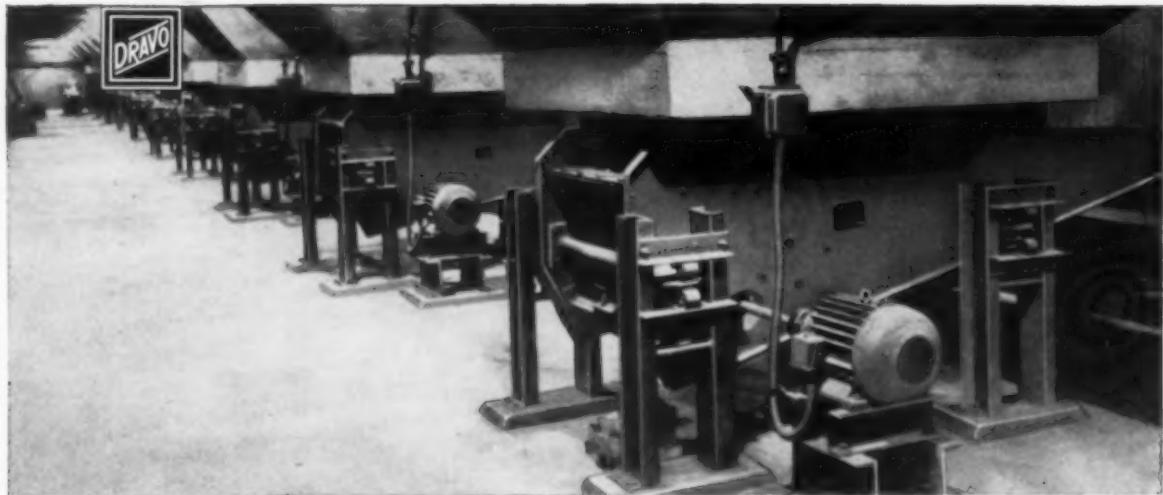
Lower first cost • High capacity operation at lowest cost per year • Single 40 HP electric motor drives all machine operations—provides maximum digging and trammimg power • All functions are controlled hydraulically from single bank of control valves • Long wheel base and wide tracks give exceptional stability and positive operation • Lowest operating height (25½") of any high capacity loader.

\*Trade marks Reg. U. S. Pat. Office

**For details or a demonstration, write . . .**

Modernization on the 88 and 188 designs is simple. Any 88 or 188 in the field may be modernized to the latest 188-D design at reasonable cost.

**The LONG Company**  
Oak Hill, W. Va.



## Low maintenance, economical operation with DRAVO-SCHENCK vibrating screens, conveyors, feeders

Low maintenance is the keynote of Dravo-Schenck equipment. In typical installations like the row of feeders shown here, repair and replacement is held to a minimum.

The reason for such economical operation is found in the precision design of the unique "Micro-Thrust" exciter unit which reduces wear by moving material with minimum contact with troughs or screens, and the rugged construction of all wearing parts.

These heavy duty screens, conveyors and feeders are at work in a wide variety of applications—handling ferrous

and non-ferrous ores, sinter, chemicals, cement clinker, crushed stone, coal and other abrasive or hard-to-handle materials.

Our engineers will gladly work with you on specific problems or write for Bulletin No. 1475, Dravo Corporation, Pittsburgh 22, Penna.

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CORPORATION

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### TRIP POST JACK No. M279

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- High Strength Aluminum Alloy Column and Castings
- Light weight — 72" min. height, weighs only 36 lbs.
- Sizes for all seam heights available



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Place a Jack alongside each of the first row of bolts closest to the face. Raise to the roof to provide temporary support. Remove bolts by hand or pneumatic wrench. Stand 25' or more away and pull on a rope attached to the Jack trip lever which collapses the Jack. Move Jack to position under the next row of bolts and proceed as previously.

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JACKS

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AS MUCH AS 50%



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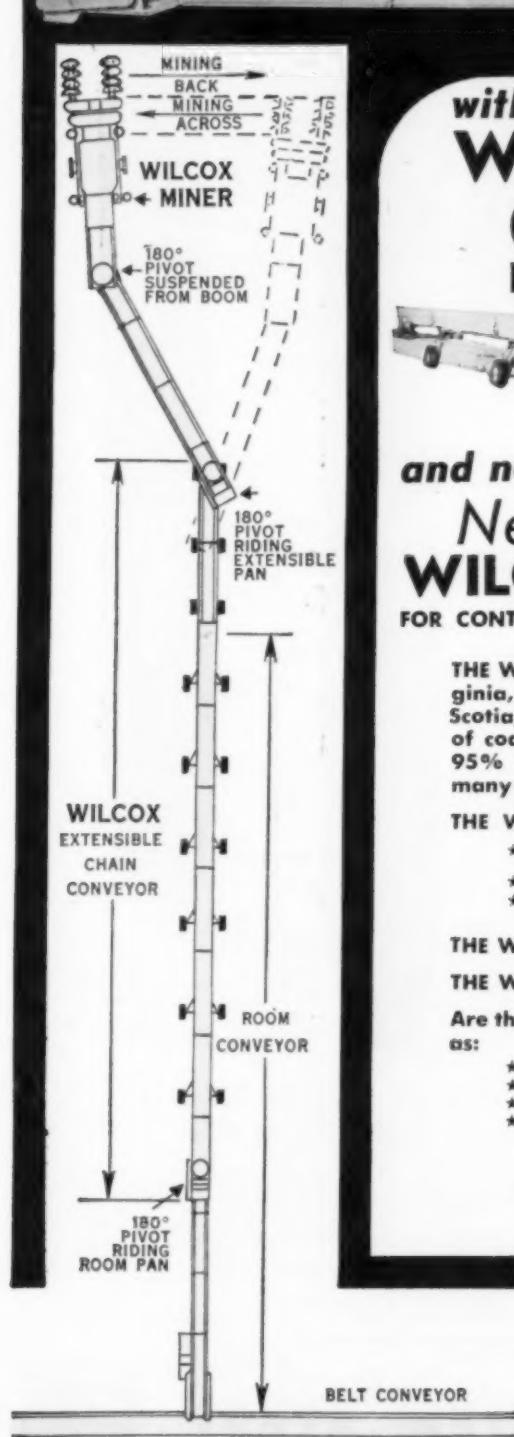
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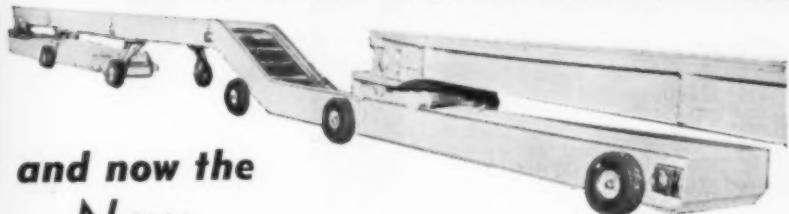
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300 West.—S.B.—Open	C3	720	
300 West.—S.B.—Open	CS-1002	600	
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- 6—Reliance 20-J Motors, 7½ H.P.
- 4—Reliance 10-J Motors, 5 H.P.
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- 1—Goodman 660 Loaders on cats, excellent.
- 3—Goodman 665 Loaders on cats, latest type.
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- 2—Joy 32E10 Shuttle Cars, rebuilt.
- 1—Joy 32E13 Shuttle Cars, rebuilt.
- 2—Joy 32E16 Shuttle Cars, rebuilt.
- 2—Joy 42E16 Shuttle Cars, rebuilt.
- 2—Joy T-2-6 low pan Cat truck.
- 1—Joy T-2-6 low pan Cat Truck with reel.
- 2—Joy T-1 Standard Cat Trucks, 220 AC.
- 1—Joy T-1 Standard Cat Truck, 250 DC.
- 2—Joy 11-B Cutting Machines, like new.
- 1—Joy 7-B Cutting Machine, like new.
- 3—Joy CD-22 Drills, like new.
- 6—Goodman 512 Machines, with Bugdusters.
- 1—Goodman Machine on Cats, 31" high, All hydraulic.
- 2—Goodman 512 cutting machine, perfect.
- 2—Goodman 512 cutting machines, 220 V AC.
- 1—Lee Nurse low vein Machine Carrier on rubber.
- 3—Jeffrey 70 URB's rubber-tired Cutters, Universal head, perfect condition.
- 1—Joy 11RU rubber-tired Cutter with bugdusters, Universal head and dual tires.
- 1—Joy 10RU rubber-tired Cutter, first class.
- 2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on cats, 250 volt DC.

#### LOCOMOTIVES

- 2—Jeffrey 13 ton, type MH-110, 36", 42" and 48" Ga.
- 2—Jeffrey 10 ton, type MH-110, 42" and 44" Ga.
- 1—Jeffrey MH-124, 6 ton, 24" overall height.
- 12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" Ga.
- 2—Jeffrey, 8 ton, type MH-100, 2" armor plate frames.
- 1—Jeffrey, 6 ton, type 2186, 22" above rail.
- 3—Jeffrey, 4 ton, type MH-96, 42", 44" and 48" Ga.
- 1—G.E. 4 ton, type 825 Locomotive, 22" high.
- 10—G.E. 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Ga.
- 1—G.E. 8 ton type 822 Locomotive, 44" Ga.
- 3—G.E. 8 ton, type 809 Locomotive, 42", 44" and 48" Ga.
- 2—Goodman, type 33, 6 ton, 44" and 48" Ga.
- 3—Goodman, 8 ton, type 32A, 36", 44" and 48" Ga.
- 3—Westinghouse, type 902, 4 ton, 42" and 48" Ga.
- 2—Westinghouse, type 904, 6 ton, 44" and 48" Ga.
- 2—Westinghouse type 906, 44" and 48" Ga.
- 2—Westinghouse, type 907, 10 ton, 44" and 48" Ga.
- 2—Diesel Locomotives, 8 & 10 tons, Excellent.
- 8—Jeffrey MH-78 Locomotive Units, cheap.
- 3—Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" Ga.

#### LOCOMOTIVES (Cont.)

- 4—Jeffrey MH-88 Locomotive Units, real bargains.
- 6—Jeffrey MH-100 Locomotive Units, reasonable.
- Locomotive Trucks and Spare Armatures for all the above.

#### TIPPLE EQUIPMENT

- 1—Cedar Rapids portable super Screening Plant.
- 1—Allis-Chalmers 5'x14' Rialto Vibrator.
- 1—5'x14' Robbins double deck Vibrator.
- 1—4'x10' Robbins Pyrex Vibrator.
- 1—Robert & Schoepf tandem Hydro-Separator.
- Boat Loading Booms.
- 1—Robins Car Shovel.
- 10—Crushers, various sizes.
- Feeders, Slag Conveyors and Loading Booms.

#### CUTTING MACHINES

- 1—Joy 10RU rubber-tired Cutter.
- 2—Jeffrey 70 UR Cutters, rubber-tired, Universal Head, low vein.
- 3—Jeffrey 29UC Universal Machines on Cats.
- 1—Joy rubber-tired 11RU Cutter with bugdusters.
- 1—Goodman on cats, 31" overall height.
- 1—Baby Goodman, 212, rebuilt, 250 volt DC.
- 1—Baby Goodman, 212, rebuilt, 220 volt, 3 phase AC.
- 1—Goodman 312, 18" high.
- 4—Goodman 512's with Bugdusters, like new.
- 4—Goodman 512's, rebuilt, or as removed from service.
- 1—Goodman 824 Slabber, cuts anywhere.
- 2—Joy 11B Cutting Machines, rebuilt.
- 2—Goodman 512 Cutting Machines, 220V, AC.
- 6—Goodman 12AA's and 112AA's.
- 2—Goodman 324 Slabbers.
- 2—Goodman 724 Slabbers.
- 6—Jeffrey 351's like new, 17" high.
- 2—Jeffrey 351's, on low vein trucks.
- 1—Jeffrey 351, 220 volt AC.
- 15—Jeffrey 359's and 358B's.
- 2—Jeffrey 298's on track.
- 2—Jeffrey 29C's truck mounted.
- 1—Jeffrey 29L on track, perfect.
- 2—Sullivan CR-10's 15" high.

#### LOADING MACHINES

- 16—Loaders, all types.
- 2—Jeffrey 6 CL's on rubber, 26".
- 3—Jeffrey L-500 Loaders.
- 2—Myers Whaley No. 3 Automer Loaders.
- 2—Clarkson Loaders, 26" above rail.

#### CONVEYORS

- 1—Jeffrey 52-B, 30' Conveyor, 1000'. Excellent.
- 4—Joy 30' Underground Belt Conveyors, 500' to 2000' each. Excellent.
- 2—Barber Greene 30' Belt Conveyor, 1000'. Excellent.
- 1—Robins 30' Belt Conveyor, 1000'.
- 1—Jeffrey 52-B, 26' Conveyor, 1200'.
- 3000' Conveyor Belt, 30'.
- 2—61EW Elevating Conveyors.
- 2—61WH 15' Room Conveyors, 300 ft.
- 2—Joy 15' Room Conveyors, 300 ft.
- 4—Joy Ludel UN-17 Shakers.
- 10—Goodman G-12½ and G-15 Shakers.
- 3—Long 400 DBH 15' Chain Conveyors, 25 H.P. Motors, new.

#### CONVERTERS AND DIESEL PLANTS

- 1—50KW G.E. TC-6, 275 volt Rotary Converter.
- 2—100KW, G.E. TCC-6's, 275 volt, Rotary Converters.
- 1—150KW, G.E. HCC-6, 275 volt, Rotary Converter.
- 1—150KW, 6 phase, Allis-Chalmers Rotary Converter, 275 volt DC, perfect.

#### CONVERTERS AND DIESEL PLANTS (Cont.)

- 1—200KW Allis-Chalmers Rotary Converter, 6 phase, 275 DC, perfect.
- 1—200KW, G.E. HCC-6 Rotary Converter, 275 volt DC.
- 3—300KW, G.E. HCC-6 Rotary Converters, 275 DC.
- 3—300KW Westinghouse 6 phase, Rotary Converters, 275 volt DC.
- 2—500KW Westinghouse Rotary Converters, 275 volt DC.
- 1—200KW Westinghouse Rotary Converter, 275 DC, (all the above with 6900/13000 and/or 2300/4000 primary transformers)
- 2—150KW MG Sets, General Electric and Westinghouse.
- 1—200KW MG Set, Westinghouse, rebuilt.
- 1—200KW MG Set, General Electric, perfect.
- 2—150KW Allis-Chalmers MG Sets, 275 DC volt, excellent 220-440 AC volt.
- 1—300KW Westinghouse 600 volt, 6 phase, Rotary Converters.
- 4—300KW Westinghouse, 600 volt, DC, 6 phase, Rotary Converters.
- 1—500KW HCC-6 Rotary Converter, 6 phase, 600 volt DC.
- 1—Commins 125 KW, Diesel with 250 volt DC Generator.
- 1—G.M.C. Diesel Plant with 60 KW Generator, 275 volt DC.
- 1—G.M.C. Diesel Plant with 85 KW Generator, 275 volt DC.
- 1—10,000 Caterpillar Diesel with 75 KW Generator, 275 volt DC.
- 1—Allis-Chalmers Natural Gas Engine with 100KW Generator, 275 volt DC.
- 1—700 H.P. Shaft Head, complete.
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- Boilers, like new, 1100 H.P. and 300 H.P. Also transformers, turbines, etc.
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#### MISCELLANEOUS

- 20—Jeffrey Molevers on rubber tires.
- 1—3½ Yard Shovel and Back-Hoe.
- 1—3½ Yard Crane on Cats.
- Battery Supply Tractors, rubber tired.
- 1—Central Air Compressor on rubber tires.
- 10—Air Compressors, 1 H.P. to 40 H.P.
- 40—Mine Pumps, all types.
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- 2—Phillips Carriers, 44" and 48" Ga.
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- 45—Mine Cars, drop bottom, 42" Ga.
- 30—Mine Cars, drop bottom, 46" Ga.
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- 1—10 ton Mine Car Scale with Recorder.
- 1—150 ton Railroad Track Scale.
- 13—Brown Fayo HKL and HG Car Spotters.
- 1—12 ton Differential Slate Lorry.
- Incline Hoists 25 to 50 H.P.
- 1—Jeffrey 6' Aerodyne Fan.
- 1—Jeffrey 8' Aerodyne Fan.
- 1—Storage Tank, 8,000 Gallon.
- 1—Jeffrey 8' Aerodyne Fan.
- 1—Storage Tank, 12,000 Gallon.
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- 1-11BU Joy Loader, 250 Volt D.C.
- 2-8BU Joy Loaders, 250 Volt D.C.
- 2-14BU-7BE Joy Loading Machines.
- 1-Joy 1000 lb. Capacity, 250 Volt D.C. Excellent
- 1-11BU-10A Joy Loading Machine
- 1-11BU-11A Joy Loading Machine, 250 V. D.C.

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- 6-6SC-5E Joy Shuttle Cars, 250 Volts D.C., elevating discharge, 4-wheel steering.
- 1-Jeffrey Shuttle Car, 4 wheel drive and steer.
- 2-6SC Joy Shuttle Cars, fixed elevated discharge, disc brakes, 3 ft. high (Matched Pair).
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- 4-6SC-7E Joy Shuttle Cars (Two Matched Pairs), modern having airplane type brakes, adjustable elevating discharge, 4-wheel drive.
- 1-2E-10 Joy Shuttle Car, 250 Volt D.C.
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- 1-Barber Greene 30' belt conveyor, 1200 ft. long, complete with 40 H.P. permissible drive, 4 plies, 42 oz. rubber belting.

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- 3-5 H.P. Long Conveyors, 300 ft. long, complete with head, tail, pans and chains.
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- 3-15 H. G. Jeffrey Chain Conveyors, complete with self-propelled conveyor heads, pans, and chains, 250 V. DC, permissible. Furnished with or without 14BU7RAE, 250 V. DC loading machines.
- 4-10 H.P. Long Conveyors, 300 ft. long complete with head, tail, pans & chains.
- 2-15' Joy Chain Conveyors 300' Long, Complete A.C.
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Two 80 ton G.E. Diesel-Electric Locomotives. Like New—built 1955. 42' track gauge, will alter to suit.

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# CAVE-IN! **But this unposed photo shows**

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We use this photo to show how well Anaconda Shovel Cable stands up under abuse. Jagged rocks, sheer drops over cliffs, water-filled ditches—the Anaconda cable is built to endure all these hazards.

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Anaconda Shovel Cable has a strong, extra-tough—yet highly flexible—neoprene jacket. It resists abrasion, mechanical abuse, flame and water. Its long-lasting Anaconda Butyl Insulation has high dielectric strength, and outstanding resistance to ozone, heat and moisture.

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58817



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**FOR SHOVEL CABLE**

# Rip and Doze with the D9— faster, cheaper than blasting



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"The D9 has increased our production and saved us considerable expense in blasting costs and time consumed," Mr. Motter reports. His foreman, Niram Whitton, adds, "We move 50% more dirt since we added the No. 9 Ripper."

Strip mine owners everywhere are reporting great savings and increased production when they switch over from shooting coal to ripping and 'dozing with the D9. Two sizes of rippers are available: the Caterpillar No. 9 Ripper for seams up to 28-inch thickness; and the giant Kelley Ripper for seams up to 5 feet.

Not only will the D9 with either ripper break up overburden and coal, but it's ready for long, low-cost hours of spoil reclamation after it finishes ripping.

Available with either torque converter or direct drive with the exclusive Caterpillar oil clutch, the D9 is ready to give you the most economical big-volume production you've ever experienced. Get in touch with your Caterpillar Dealer. Let him show you, at your mine, how the D9 with No. 9 Ripper or Kelley Ripper will cut your costs on ripping overburden or coal. Have him demonstrate the high production 'dozing of overburden and spoil, too. He has the best buy for you—and the best after-sale service and parts.

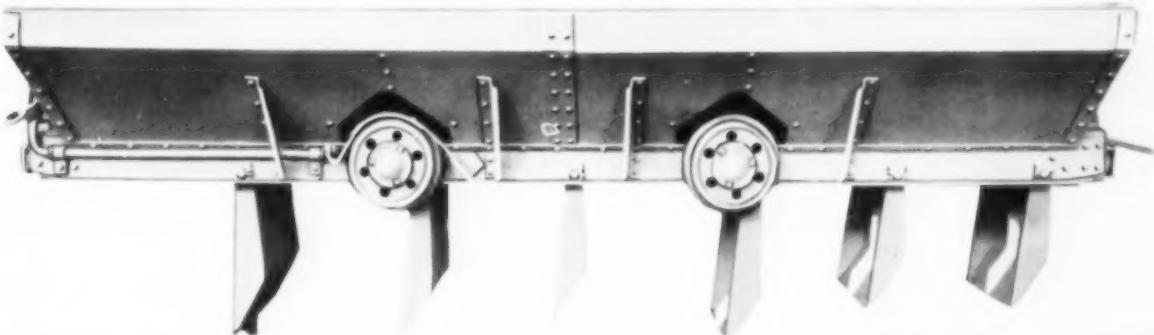
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THE D9—POWER,  
VERSATILITY, DEPENDABILITY

only **ACF** automatic drop bottom cars have



## LUBRICATED DOORS!

- Smoother, faster operation
- Minimum wear, year after year
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**ACF** Mine Cars  
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*MINE CARS FOR CONSTANT HAULAGE.*



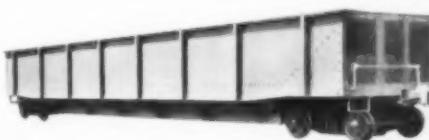
3-DOOR, 4-WHEEL DROPOUT CAR



4-DOOR, 4-WHEEL DROPOUT CAR



4-DOOR, 8-WHEEL DROPOUT CAR



3-DOOR, 8-WHEEL DROPOUT CAR



*Clinchfield Coal Co. awards another contract to Link-Belt—now for a*

# 1500 TPH PREPARATION PLANT



**PLANT OF TOMORROW.** Moss Plant No. 3 is located near Dante, Va., in the heart of what is probably the largest and most valuable unexploited metallurgical coal block remaining in the U. S. Scheduled to begin operations late in 1958, the new plant will be a big brother of Moss Plant No. 2 which was completed by Link-Belt in October, 1956.



## New Moss No. 3 preparation facilities to have over three times the output of Moss No. 2

1,500 tons of R.O.M. coal per hour will be processed in Moss No. 3 preparation plant of Clinchfield Coal Co., Division of The Pittston Company. And, as at Moss No. 2, the entire assignment—design through erection—is being handled by Link-Belt.

To assure maximum recovery and uniformly clean metallurgical and steam coal, the heavy-media separation process is to be utilized. And a Link-Belt water clarification system permits a closed water circuit. By filtering, treating and reusing process water, the plant will conserve its water and avoid pollution.

Whether you're planning a new plant or want to cut your present preparation costs—look to Link-Belt's complete equipment line and engineering background. For facts, call your Link-Belt office. Ask—or write—for Book 2655.

**LINK-BELT**

COAL PREPARATION AND HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Birmingham 3, Cleveland 20, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 2, Pittsburgh 13, Seattle 4, St. Louis 1. To Serve Industry There are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarborough (Toronto 13); South Africa, Springs. Representatives Throughout the World.